INVITATION TO BID
DISPATCH CENTER UNINTERRUPTIBLE POWER SUPPLY PROJECT

The Town of Nantucket, the Awarding Authority invites qualified bidders to submit bids for the supply and installation of an Uninterruptible Power Supply (UPS) for the Nantucket Public Safety Dispatch Center located at 4 Fairgrounds Road.

Bids are due no later than **February 2, 2016 at 2:00 PM**. in the office of the Chief Procurement Officer, Town of Nantucket, 16 Broad Street, 2nd Floor, Nantucket, MA 02554.

Bidders shall not include Federal Excise Taxes or Commonwealth of Massachusetts Sales Taxes for which the Town of Nantucket is exempt.

The Bids shall be completely filled in, signed, enclosed in an envelope, sealed and plainly marked with **"DISPATCH CENTER UPS PROJECT BID"**. Each bid shall specify each and every item as set forth in the attached specifications and General Conditions. Any and all exceptions must be clearly stated in the bid proposal your firm submits. Failure to set forth any item in the specifications shall be grounds for rejection. The Bids shall be filed with the Town at the location designated above.

A Non-Mandatory Pre-Bid Conference will be held on Tuesday, January 26, 2012 at 11:00 a.m. at the Nantucket Public Safety Building, 4 Fairgrounds Road, Nantucket, MA 02554.

BID SUBMITTAL FORM

To: Town of Nantucket: **DISPATCH CENTER UPS PROJECT BID**

A. The undersigned proposes to furnish all labor and materials, deliver, install all components and make associated wiring modifications for the Uninterruptible Power Supply (UPS) system for the Nantucket Public Safety Dispatch Center located in Nantucket, MA in accordance with the accompanying specifications and drawings, for the contract price specified below, subject to additions and deductions according to the terms of the specifications.

B. This bid includes addenda numbered _____.

C. The proposed **BASE CONTRACT PRICE** to furnish all labor, materials, deliver, install all components and make associated wiring modifications for the Uninterruptible Power Supply (UPS) system for the Nantucket Public Safety Dispatch Center located in Nantucket, MA is:

_____ U.S. Dollars **$** _____
Base Contract Bid Amount in Words — Bid Amount in Numbers

D. **ALTERNATE NUMBER 1:** The proposed **ALTERNATE #1 PRICE** to furnish all labor, materials, deliver, install all components and make associated wiring modifications for the Replacement of sixty (60) batteries in the UPS cabinet as shown on the Electrical Drawings. Costs to include removal and disposal of existing batteries. Cost for ALTERNATE #1 is:

_____ U.S. Dollars **$** _____
Alternate #1 Bid Amount in Words — Bid Amount in Numbers

E. **TOTAL BID PRICE:**

Base Contract Bid (Item C) Amount in Numbers	**$**
Alternate #1 Bid (Item D) Amount in Numbers	**$**
TOTAL BID AMOUNT (Base + Alternate) in numbers	**$**

F. **Required** Five Percent (5%) Bid Deposit Submitted with this bid: $_____
(TOTAL BID multiplied by 5%)

G. The undersigned agrees that, if selected as general contractor, he will within five days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the awarding authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the awarding authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price.

H. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A.

I. The undersigned further certifies under penalties of perjury that his bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word “person” shall mean natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

_____
Name of General Bidder

Signature ► BY: _____
Signature & Title of person signing bid

Date:_____

_____
Business Address

_____
(City and State)

Note: If the bidder is a corporation, indicate state of incorporation under signature, and affix corporate seal; if a partnership, give full names and residential addresses of partners if different from business addresses.

CERTIFICATION OF NON COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

VENDOR: _____

SIGNATURE: _____

DATE: _____

THIS PAGE MUST BE INCLUDED WITH YOUR SUBMISSION

TAX COMPLIANCE CERTIFICATION

Pursuant to M.G.L. 62C, §49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

EIN: _____
Federal Employer Identification Number

VENDOR: _____

SIGNATURE: _____

DATE: _____

THIS PAGE MUST BE INCLUDED WITH YOUR SUBMISSION

GENERAL CONDITIONS AND INSTRUCTIONS

The Town of Nantucket, through its Town Administration, invites qualified bidders to submit bids for all labor and materials, delivery, installation of all components and make associated wiring modifications for an Uninterruptible Power Supply (UPS) system for the Nantucket Public Safety Dispatch Center located in Nantucket, MA

I. GENERAL INFORMATION AND BID SUBMISSION REQUIREMENTS

A. Bids and specifications can be obtained from and will be accepted at the Town of Nantucket, Procurement Office, 16 Broad Street, Nantucket, MA 02554, until Thursday, October 15, 2015 @ 3:00 PM and publicly opened forthwith for this Invitation for Bids which is made in accordance with M.G.L. c 149. Two copies of the bid are required. The bid envelope must be sealed and clearly marked:
DISPATCH CENTER UPS PROJECT BID

B. Award date. Award will be made within thirty (30) days after bid opening unless otherwise stated in the specifications or the time for award is extended by mutual consent of all parties. All bids submitted shall be valid for a minimum period of sixty (60) calendar days following the date established for acceptance.

C. If any changes are made to this IFB, an addendum will be issued. Addenda will be mailed or faxed to all bidders on record as having requested the IFB. Each responder shall acknowledge receipt of any and all addendum issues by submitting acknowledgment forms provided with any Addenda. Failure to do so shall be cause to reject the submittal as being unresponsive.

D. Questions concerning this IFB must be submitted in writing to: Heidi Bauer, Chief Procurement Officer, 16 Broad Street, Nantucket, MA 02554 before Tuesday, February 2, 2016. Questions may be delivered, mailed, emailed (hbauer@nantucket-ma.gov) or faxed. Written responses will be mailed or faxed to all bidders on record as having requested the IFB.

E. Bids may be modified, corrected or withdrawn only by written correspondence received by the Town of Nantucket prior to the time and date set for the bid opening. Bid modifications must be submitted in a sealed envelope clearly labeled "Modification No. ___" and must reference the original IFB.

F. After the bid opening, a bidder may not change any provision of the bid in a manner prejudicial to the interests of the Town of Nantucket or fair competition. Minor informalities will be waived or the bidder will be allowed to correct them. If a mistake and the intended bid are clearly evident on the face of the bid document, the mistake will be corrected to reflect the intended bid, and the bidder will be notified in writing; the bidder may not withdraw the bid. A bidder may withdraw a bid if a mistake is clearly evident on the face of the bid, but the intended correct bid is not similarly evident.

G. The Town of Nantucket reserves the right to reject any and all bids and to waive any informality in bids received whenever such rejection or waiver is in its best interest.

H. The Town of Nantucket will not be responsible for any expenses incurred in preparing and submitting bids. All bids shall become the property of the Town of Nantucket.

I. Responders must be willing to enter into the Town of Nantucket's standard form of contract that will include the scope of services description of this IFB.

J. The bid, and any subsequent contract for the services, is hereby issued in accordance with applicable Massachusetts General Laws. The selected bidder shall be expected to comply with all applicable state and federal laws in performance of service.

K. PREVAILING WAGE: Pursuant to Massachusetts General Laws, chapter 149, sections 26 and 27, the Division of Occupational Safety (formerly the Department of Labor and Industries) has determined the Prevailing Wage Rates for this work. The enclosed rates apply only to this work. The Prevailing Wage shall become part of the contract signed between the successful bidder and the awarding authority or the contract is invalid. Prevailing Wages must be paid to all persons employed on the public works project, regardless of whether they are employed by the successful bidder or a subcontractor. The wage rates issued for each project shall be paid for the entire project. Payroll records must be kept by the successful bidder for all persons employed on the project. A separate Statement of Compliance must be submitted to the Division of Occupational Safety by every employer, including all prime contractors and subcontractors, when its portion of the work is completed. The enclosed form entitled “Weekly Payroll Records Report and Statement of Compliance" clearly details these requirements. A certified payroll must be submitted to the Board of Selectmen office for each week work is performed for the Town under this contract.

L. Bids received prior to the date of opening will be securely kept, unopened. No responsibility will attach to an officer or person for the premature opening of a bid not properly addressed and identified.

M. Any bids received after the advertised date and time for opening will be returned to the responder unopened.

N. Purchases by the Town of Nantucket are exempt from federal, state and municipal sales and/or excise taxes.

O. The Tax Compliance Certification and the Certificate of Non-Collusion must be included with the bid response. The bid must be signed by the authorized individual(s).

P. Unexpected closures. If, at the time of the scheduled bid opening, Town Hall is closed due to uncontrolled events such as fire, snow, ice, wind or building evacuation, the bid opening will be postponed until 3:00 PM on the next normal business day. Bids will be accepted until that date and time.

Q. The Town of Nantucket is an Affirmative Action/Equal Opportunity Employer. The Town encourages bids from qualified MBE/DBE/WBE firms.

R. Bidders should be aware that many overnight mailing services do not guarantee service to Nantucket.

S. OSHA REQUIREMENT: Contractor must comply with: Chapter 306 of the Acts of 2004 § 1. who shall certify that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

II. BID SUBMISSION REQUIREMENTS.

A. The Tax Compliance Certification must be included with the bid response. The bid must be signed by the authorized individual(s).

B. A signed Certificate of Non Collusion must be submitted with the bid response.

C. Bidders must submit a bid deposit of five percent (5%) of the amount of the base bid. Bid deposit may be in the form of a certified check; a bank, treasurers or cashier's check; or a bid bond from a surety company.

D. Bid Submittal Form to include the Base Bid and Alternate items.

E. Signature page from the Town's contract, signed by an authorized individual as a good faith statement that the contractor is willing to enter into the Town's standard contract form.

F. Current Certificate(s) of Insurance.

G. Reference list.

H. Current copies of OSHA 10 training cards for all individuals who will be working on this project.

I. Evidence of DCAM certification.

III. INSURANCE REQUIREMENTS:

A. Workers' Compensation, covering the obligations of the CONTRACTOR in accordance with applicable Workers' Compensation or Benefits laws.

B. Commercial General Liability Insurance on an occurrence basis with a combined single limit of not less than $1 million. Coverage is to include premises and operations, coverage for liability of subcontractors. The policy shall contain an endorsement stating that the aggregate limits will apply separately to the work being performed under this Agreement.

C. Automobile Liability Insurance of not less than $1 million combined single limit covering owned, hired and non-hired vehicle use.

IV. QUALITY REQUIREMENT.

A. Bidders must provide all of the items described in Section II and comply with all of the bid submission requirements listed in Sections one through three.

B. Bidder must have been regularly and actively engaged in the Electrical Contracting or repair business, operating under the same business name and business organization structure; and performing the type of work described in the Specifications for a minimum of five (5) years and must provide proof of this.

C. Bidder must provide proof of Insurance(s) in the bid.

V. REFERENCES.

A. Bidders must provide a complete list of municipal customers (preferred) or large corporate customers who it provided services for in the past three years. Reference information must include Company/Government Name, Contact Person, Current Phone Number, Fax Number and date of purchases. Poor references, or lack of municipal customers, may be a basis for determining that a bidder is not responsible.

VI. RULE FOR AWARD.

A. One contract will be awarded to the responsive and responsible bidder who meets the qualifying factors, can provide the services requested and offering the lowest LUMP SUM BID AMOUNT. This is a lump sum amount contract which includes all costs associated with the items needed to complete the work as required. In the event of a tie of two vendors, the vendors will be invited to the procurement office for a coin toss to break the tie. In the event of a tie of more than two vendors, the vendors will be invited to the procurement office for a drawing of straws to break the tie.

VII. BASIS OF COMPENSATION.

A. Lump sum amount contract including all costs associated with the items needed to complete the work as required.

VIII. PRE-BID CONFERENCE

A. A Non-Mandatory Pre-Bid Conference will be held on Tuesday, January 26, 2012 at 11:00 a.m. at the Nantucket Public Safety Building, 4 Fairgrounds Road, Nantucket, MA 02554.

IX. ALTERNATES

A. Instructions to Bidders and General Conditions shall be binding on the Contractor and/or Subcontractor who performs this work.

B. DEFINITIONS:

1. Alternate, an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents. The cost for each alternate is the net addition to the Contract Sum to incorporate alternate into the work. No other adjustments are made to the Contract Sum.

C. PROCEDURES

1. Coordination: Modify or adjust affected work as necessary to completely integrate work of the alternate into Project. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate. Execute accepted alternates under the same conditions as other work of the Contract.

2. Schedule: A Schedule of Alternates is included at the end of this Section. Specifications Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

D. SCHEDULE OF ALTERNATES

1. Alternate #1: Replace (60) batteries in UPS as shown on the Electrical Drawings. Include removal and disposal of existing batteries.

SECTION 011100

SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Instructions to Bidders, General Conditions and General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.2 PROJECT DESCRIPTION

A. The Project consists of the installation of a new Data Center Uninterruptible Power Supply at the Nantucket Public Safety Building as shown on Contract Documents prepared by Garcia Galuska DeSousa, Inc.

B. The Work consists of:

1. Installation of a new uninterruptible power supply including associated power wiring. Existing battery cabinet and tub will be split so one will be served by the original UPS and one will be served by the new UPS.

1.3 WORK SEQUENCE

A. The Work will be conducted in a manner to provide the least possible interference to the activities of the building. The building will remain occupied during the contract work.

1.4 CONTRACTOR USE OF PREMISES

A. General: Limit use of the premises to construction activities allow for Owner occupancy and use by the public.

1. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

2. Confine the parking of workmen's and construction vehicles, and the storage of construction materials to the staging area.

3. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to before and after hours and minimize space and time requirements for storage of materials and equipment on site.

B. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

1. Repair damage caused by damaged or interrupted utilities.

1.5 OWNER OCCUPANCY

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and maintain a fully operational facility. Perform the Work so as not to interfere with the Owner's operations.

1. Coordinate all Work with the Engineer and Owner's Representatives to insure that operational and environmental conditions, satisfactory to the Owner and Engineer, are maintained during all phases of Construction. Schedule and coordinate the Work to minimize the shut down of any portions of the building or systems at any specific time.

2. Obtain prior approval for the shut down of any portions of the building or systems at times designated by the Owner.

3. Ensure safe, barrier-free access to, safe, barrier-free egress from, and security of existing areas and equipment by the employees and public.

a. The safety of building occupants requires that nothing shall be done, in any way, to block the passageways in or about the exits themselves. Neither shall there be any unauthorized interference with the free and unobstructed use of hallways, stairways, toilets and rooms.

4. Schedule and coordinate the Work so as not to disrupt access to the building. Obtain prior approval from the local Building Official and Fire Department, and Town before commencement of work that may disrupt safe, barrier-free access to the building by the staff and public.

a. It is the intent that a contract shall be awarded on February 17, 2016 with a Notice to Proceed issued February 18, 2016. The work shall commence immediately and shall be substantially completed by May 1, 2016.

b. When necessary for tradesmen to work in any portion of the premises normally occupied by the Town, application must be made, before entering, to the Owner, who will perfect a working agreement with the building occupants, so that work may be carried forward in a manner to interfere as little as possible.

B. Project Completion: Achieve Full Completion for the entire project no later than 5:00 p.m. on the respective dates mentioned above.

1.6 INTENT

A. These Specifications are intended to describe and illustrate all material, labor, and equipment necessary to complete the Electrical scope of work described here within.

B. For convenience of reference, these Specifications are separated into titled Divisions and Sections. Such separations shall not, however, operate to make the Engineer an arbiter to establish limits to Contracts between the Contractor and Subcontractors. The Divisions of the Specifications do not necessarily define the limits of the Contractor's subcontracts, the work of anyone subcontract may include items specified in several Divisions or Sections. The Contractor may sublet work as he sees fit, but it is his responsibility to see that all work specified is completed in accordance with the Contract and required by codes.

C. Furnish all materials and accomplish all work in strict accordance with the grades or standards of materials, standards of workmanship, and manufacturer's specifications listed or mentioned in these documents.

D. The listing or mention of materials shall be sufficient indication that all such materials shall be furnished by the Contractor, in accordance with the grades or standards indicated, free from defects impairing strength, durability or appearance and in sufficient quantity for the proper and complete execution of the work, unless specifically stated otherwise.

E. The listing or mention of any method of installation, erection, fabrication or workmanship shall not operate to make the contractor an agent, but shall be for the sole purpose of setting a standard of quality for the finished work. Contractor is free to use any alternate method, provided only that, prior to the start of the work, such alternate method is approved in writing by the Engineer, as resulting in quality equal to that intended by these documents. Unless an alternate method is approved, all work shall be in strict accordance with all methods if installation, erection, fabrication and workmanship listed or mentioned herein.

1.7 SOCIAL SECURITY TAXES

A. The Contractor and each Subcontractor shall pay the taxes measured by the wages of all their employees as required by the Federal Social Security Act and all amendments thereto, and accept the exclusive liability for said taxes. The Contractor shall also indemnify and hold the Owner, and its respective officers, agents and servants and the Engineer harmless on account of any tax measured by the wages aforesaid of employees of the Contractor and his subcontractors, assessed against the Owner under authority of said law.

1.8 UNEMPLOYMENT INSURANCE

A. The Contractor and each Subcontractor shall pay unemployment insurance measured by the wages of his employees as required by law and accept the exclusive liability for said contributions. The Contractor shall also indemnify and hold harmless the Owner on account of any contribution measured by the wages of aforesaid employees of the Contractor and his Subcontractors, assessed against the Owner under authority of law.

1.9 OCCUPATIONAL SAFETY AND HEALTH ACT

A. The Contractor shall comply with the requirements of the Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, including all standards and regulations which have been promulgated by the Governmental Authorities which administer such Acts and said requirements, standards and regulations are incorporated herein by reference.

B. The Contractor shall comply with said regulations, requirements and standards and require and be directly responsible for compliance therewith on the part of his agents, employees, material men and Subcontractors; and shall directly receive and be responsible for all citations, assessments, fines or penalties which may be incurred by reason of his agents, employees, material men or Subcontractors failing to so comply.

C. The Contractor shall indemnify the Owner and Engineer and save them harmless from any and all losses, costs and expenses, including fines and reasonable attorney's fees incurred by the Owner and Engineer by reason of the real or alleged violation of such laws, ordinances, regulations and directives, Federal, State, and Local, which are currently in effect or which become effective in the future, by the Contractor, his Subcontractors or material men.

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION (Not applicable).

END OF SECTION

PROJECT COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.2 SUMMARY

A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

1. Coordination.
2. Progress Meetings.
3. Administrative and supervisory personnel.
4. General installation provisions.
5. Cleaning and protection.

1.3 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

No claim for extra compensation or extension of Contract time will be allowed for conditions resulting from a lack of said coordination and cooperation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project Close-out activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

1.4 PRE-CONSTRUCTION CONFERENCE

A. The Engineer will schedule a pre-construction conference and organizational meeting at the Project site no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Attend the meeting to review responsibilities and personnel assignments.

B. Attendees: The Owner, Engineer and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

1. Notify and arrange for attendance by all parties except the Engineer and Owner.

C. Agenda: Items of significance that could affect progress will be discussed, including such topics as:

1. Tentative construction schedule.
2. Critical Work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, Work and storage areas. .
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
14. Security.
15. Housekeeping.
16. Working hours.

1.5 SUBMITTALS

A. Staff Names: Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

1.6 COORDINATION MEETINGS

A. Conduct Project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to regular progress meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.7 PROGRESS MEETINGS

A. The Engineer will conduct progress meetings at the Project site at regularly scheduled intervals. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: Notify each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities, to attend these meetings. Persons familiar with the Project and authorized to conclude matters relating to progress shall be represented.

C. Agenda: Review and correction or approval of minutes of the previous progress meeting. Review of other items of significance that could affect progress. Topics for discussion as appropriate to the current status of the Project.

1. Contractor's Construction Schedule: Prepare a written report including progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

2. Review of present and future needs of each entity present, including such items as:

a. Interface requirements.
b. Time.
c. Sequences.
d. Deliveries.
e. Off-site fabrication problems.
f. Access.
g. Site utilization.
h. Temporary facilities and services.
i. Hours of Work.
j. Hazards and risks.
k. Housekeeping.
1. Quality and Work standards.
m. Change Order proposals.
n. Documentation of information for payment requests.

D. Reporting: The Engineer will prepare and distribute copies of minutes of the meeting to each party present. Contractor shall distribute copies to other parties who should have been present.

1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Engineer for final decision.

F. Recheck measurements and dimensions, before starting each installation.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Engineer for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

SECTION 013300

SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, Legal and Procedural Requirements including General and Supplementary Conditions and Division 1 General Requirements including the Table of Contents, apply to work of this section.

1.2 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

A. Shop drawings are drawings, diagrams, schedules and other data which shall be specifically prepared for the Work by the Contractor, manufacturer, supplier or distributor to illustrate some portion of the work.

B. Product data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished to illustrate a material, product or system for some portion of the work.

C. Samples are physical examples which shall illustrate materials, equipment, or workmanship, and shall establish standards by which work is judged.

D. The Contractor shall review, approve and submit with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor all shop drawings, project data and samples required by the Contract Documents.

E. By approving and submitting shop drawings, product data and samples, the Contractor represents that he has determined and verified all materials, field measurements and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained with such submittals with the requirement of the work and of the Contract Documents.

F. The Engineer will review and take appropriate action upon submittal of Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and the information given on the Contract Documents. Such action will be taken with reasonable promptness so as to cause no delay. The Engineer's acceptance of a specific item shall not indicate approval of an assembly of which the item is a component. The Engineers review of a Shop Drawing does not include the checking of dimensions, clearness, or quantities nor the verification of actual field conditions which shall be the Contractor's responsibility.

G. The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Engineer's approval of Shop Drawings, Product Data or Samples unless the Contractor has specifically informed the Engineer in writing of such deviation at the time of submission and the Engineer has given written acceptance of the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in Shop Drawings, Product Data or Samples by the Engineer's approval thereof.

H. The Contractor shall direct specific attention, in writing on resubmitted Shop Drawings, Product Data, or Samples, to revisions other than those requested by the Engineer on previous submittals.

I. No portion of the Work requiring submission of a Shop Drawing, Product Data, or Sample shall be commenced until the submittal has been approved by the Engineer as provided herein. All such portions of the Work shall be in accordance with accepted submittals.

1.3 SUBMITTAL REQUIREMENTS

A. Standard manufactured items - submit a minimum of six (6) of manufacturer's data sheets, showing illustrated cuts of the item(s) to be furnished, scale details, sizes, dimensions, capacities, performance characteristics, wiring diagrams, controls, and other pertinent information. If more than one size or type is shown, indicate clearly each item(s) to be furnished. When approved or disapproved, the Engineer will retain one copy. Submit sufficient copies for all other parties. No "Not Approved" or "Amend and Resubmit" copies shall be sent to the job site.

B. For all other shop drawings, submit one (1) reproducible transparency until final approval is obtained. Maximum size of shop drawing shall be 24" x 36". On completion of checking, the Engineer will obtain record prints of each transparency, returning the transparency to the Contractor.

C. Transparencies returned "approved" and/or "approved as noted", shall be distributed and processed as set forth. The Contractor shall obtain and distribute adequate prints for construction, including one print of each for the Owner's project representative, and then return the transparencies to the Contractor supplier from whom he originally received them.

D. Transparencies returned "amend and resubmit" or "not approved" shall be processed as set forth. The Contractor shall first obtain a record print and then forward the transparencies to source for correction of original drawings, and resubmission of a new transparency as above.

E. Each drawing shall have the title block on the right hand side containing the following data:

- Name of Product

- Engineer

- General Contractor

- Contractor

- Date of Submission

F. Each drawing shall have a clear space on the right hand side for approval stamp of both the Engineer and the Contractor. The Engineer's stamp shall contain the following data:

_____ Approved

_____ Approved as noted

_____ Amend & resubmit

_____ Not approved

The Engineer and Contractor shall insert the date of action taken and an identification of the person taking the action.

1.4 SHOP DRAWING GRADING

- Approved: No corrections, no marks

- Approved as noted: Resubmission not required. Minor amount of corrections; all items can be fabricated without further corrections to original drawing; checking is complete and all corrections are deemed obvious without ambiguity.

- Amend & resubmit: Resubmission required. Items must not be fabricated without further corrections. Checking is not complete; details of items checked are to be clarified further before full approval can be given. Resubmit new drawings with noted corrections.

- Not Approved" Drawing is rejected as not in accord with the contract. When returning drawing reasons for rejection will be stated. Correct and resubmit. Do not fabricate.

1.5 PROGRESS SCHEDULE

A. In order to facilitate coordination and fitting, prepare a "Plan of Operations and Progress Schedule" which shall show concisely the manner in which work will be started, prosecuted, and how the interrelationship of the work is to be completed. The overall timing shall conform to the requirements of the Owner agreement. The Plan of Operations and Progress Schedule shall be "weighted" to schedule each trade in proportion to the entire project.

B. The Plan of Operations and Progress Schedule shall be specific in nature within any particular sub-trade; e.g., the Contractor's Schedule shall indicate the start and finish of the various portions of work within the scope of his work. The schedule shall reveal the commencement date and completion date for each and every phase of the work such as underground duct banks, utility co. scheduling, switchboard modifications, etc.

C. In preparing the above Plan of Operations and Progress Schedule the Contractor shall assure that the methods, dates and other pertinent matter are acceptable to the Engineer and, when completed, he shall submit to and obtain approval from the Engineer.

D. After approval of the above Plan of Operations and Progress Schedule the Contractor shall be responsible for seeing that it is adhered to and for ascertaining that proper coordination is maintained between work of all trades. Approval of the above Plan of Operations and Progress Schedule will not relieve the Contractor from completing the project on time.

E. If for any reason the progress schedule should fall behind schedule by 15 calendar days (maximum), the Contractor shall prepare a new progress schedule which shall be changed to indicate the manner in which the Contractor will complete the project within the time allowed for construction.

1.6 SCHEDULE OF MATERIALS

A. Within two (2) weeks after the award of Contract, the Contractor shall submit to the Engineer a schedule of any materials specified for the work which are likely to cause delay due to unavailability, extended delivery dates, or any other reason.

B. The schedule shall contain a list of materials, the name of the supplier or suppliers that the Contractor contacted in attempting to purchase the material, the project delivery dates and the reason for the anticipated delay.

C. The Contractor shall assume full responsibly for delay attributed to unavailability, insufficient time for delivery and/or installation of material or performance of the work, unless he has conformed with paragraphs A. and B. above, except as noted in paragraph D. below.

D. Delays in delivery of material caused by factors beyond the Contractor's control and occurring after the time stipulated in Paragraph A. above, shall not be deemed to be the responsibility of the Contractor.

1.7 SCHEDULE OF VALUES

A. Prior to the first request for payment, the Contractor shall submit to the Engineer and the Owner a Schedule of Values of the various portions of the work in sufficient detail to reflect various major components of each trade, including quantities when requested, aggregating the total contract sum, and divided so as to facilitate payments for work under each Section in accordance with the Contract Form. The schedule shall be prepared in such form as specified or as the Engineer or Owner may approve, and it shall include data to substantiate its accuracy. Each item in the Schedule of Values, including breakdown and values, requires the approval of the Engineer and the Owner and shall be used only as a basis for the Contractor's request for payment.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

SECTION 015000

TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.2 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

B. Temporary utilities required include but are not limited to:

1. Electric power and light.
2. Telephone service.

C. Security and protection facilities required include but are not limited to:

1. Barricades, warning signs, lights.
2. Environmental protection.

1.3 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police and Fire Department rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.

2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility within 15 days of the date established for commencement of the Work. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials; if acceptable to the Engineer, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

C. Water and Electric: Existing service is available for the Contractor's use.

2.2 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Engineer, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

C. The Contractor shall be responsible for providing temporary toilet facility for contractor use.

D. First Aid Supplies: Comply with governing regulations.

E. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required, at no additional cost to the Owner.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.

B. Protection: Protect the building at all times from damages from rain water, backing up of drains and all other water.

1. Protect the building and the site from damage, loss or liability due to theft or vandalism when the work is not in progress at night, weekends, or holidays.

2. Exercise precaution for the protection of persons and property at all times. Observe the provisions of applicable laws and construction codes. Take additional safety and health measures, or cause such measures to be taken as reasonably necessary. Maintain guards on machinery, equipment and other hazards as set forth in the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, to the extent that such provisions are not in contravention of applicable laws.

3. Protect and preserve in operating conditions all utilities traversing the work area. Repair all damages to any utility due to work performed under this Contract, the satisfaction of the Engineer at no additional cost to the Owner.

C. Temporary Lifts and Hoists: Provide facilities for hoisting materials, rubbish, and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

D. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

B. Security Enclosure and Lockup: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

C. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

END OF SECTION

SECTION 017329

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform Work.
4. Indicate dates when cutting and patching is to be performed.
5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
7. Approval by the Engineer to proceed with cutting and patching does not waive the Engineer's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

a. Foundation construction.
b. Bearing and retaining walls.
c. Structural concrete.
d. Lintels.
e. Window Wall Systems.
f. Structural decking.

g. Miscellaneous structural metals.
h. Exterior and/or interior masonry wall construction.
i. Equipment supports.
j. Piping, ductwork, vessels and equipment.
k. Roof Systems.
l. Wood Trusses.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

a. Shoring, bracing, and sheeting.
b. Primary operational systems and equipment.
c. Air or smoke barriers.
d. Water, moisture, or vapor barriers.
e. Membranes and flashings.
f. Fire protection systems.
g. Noise and vibration control elements and systems.
h. Control systems.
i. Communication systems.
j. Electrical wiring systems.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Engineer's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. Engage a recognized, experienced and specialized firm to cut and patch the following categories of exposed Work:

a. Processed concrete finishes.
b. Bearing walls.
c. Masonry and Tile Work.
d. Roofing Systems.
e. Woodwork.
f. Spray fireproofing.
g. Window systems.
h. Acoustical ceilings.
i. Finished wood flooring.
j. Carpeting.
k. Wall covering.
l. HVAC enclosures, cabinets or covers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and other trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

A. Temporary support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
4. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore spray fireproofing to original U.L. listed ratings.
3. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
4. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

    a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken wall area containing the patch, after the patched area has received primer and second coat.

5. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

D. Finish Installation: Comply with manufacturer's instructions and install materials as indicated in respective Sections of the Specification.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely, paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 017700

PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

A. This SECTION 017700 contains requirements for the following:

1. Closeout procedures for substantial completion and final acceptance
2. Adjusting
3. Project record documents
4. Operation and maintenance manuals
5. Warranties
6. Spare parts and maintenance materials

1.2 CLOSEOUT PROCEDURES - SUBSTANTIAL COMPLETION

A. Prior to requesting inspection for certifications of Substantial Completion, complete the following:

1. On Application for Payment, show 100 percent completion for portions of work claimed as Substantially Complete. Submit list of incomplete items, value of incomplete work, and reasons work is not complete.
2. Submit all product and installation warranties, workmanship bonds, maintenance agreements, installer certifications and similar documents specified in individual SECTIONS of the Specifications.
3. Complete adjusting of all operating products.
4. Remove surplus materials, rubbish and similar elements.
5. Submit application for reduction of retainage.
6. Submit notification of shifting insurance coverages.
7. Submit all test reports.

B. Within 2 weeks after receipt of the notice of Substantial Completion from the Contractor, the Engineer will inspect to determine status of completion.

1. Should the Engineer determine that the work required under this Contract is not Substantially Complete:

a. The Engineer will notify the Contractor in writing, stating the reasons therefore.
b. The Contractor shall remedy the deficiencies within thirty (30) calendar days, and send a second written notice of Substantial Completion to the Architect, requesting re-inspection.

C. When the Engineer concurs that the work is Substantially Complete:

1. The Engineer will prepare CERTIFICATE OF SUBSTANTIAL COMPLETION, in accordance with the requirements of the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS, accompanied by the Subcontractors list of items to be completed or corrected, as verified by the Engineer.
2. The Engineer will submit the Certificate to the Owner, and to the Contractor, for their written acceptance of the responsibilities, assigned to them in the Certificate.

1.3 CLOSEOUT PROCEDURES - FINAL ACCEPTANCE

A. Prior to requesting inspection for certificate of Final Acceptance and final payment, perform the following:

1. Completion of incomplete work, submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
2. Prove that all taxes, fees and similar legal obligations have been paid.
3. Submit final payment requests with release of all liens, and supporting documentation.
4. Provide assurances that all unsettled claims are in the process of and will be resolved.
5. Submit updated final statement, including accounting for final additional changes to the Contract Sum. Show additions Contract Sum, additions and deductions, previous Change Orders, total adjusted Contract Sum, previous payments and Contract Sum due.
6. Submit consent of surety to Final Payment.
7. Submit evidence of continuing insurance coverage complying with insurance requirements.
8. Remove remaining temporary facilities and services.
9. Deliver to Owner and obtain receipts for:

    a. Operation and Maintenance Manuals for items so listed in individual SECTIONS of the Specifications, and for other items when so directed by the Engineer.
    b. Project Record Documents, including reproducible mylars.
    c. Warranties and bonds specified in individual SECTIONS of the Specifications.
    d. Spare parts and materials extra stock.
    e. List of service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service and all times including nights, weekends, and holidays.

10. Submit certification stating work required under this Contract has been inspected for compliance with the Contract Documents.
11. Submit certification stating that work required under this Contract is 100 percent complete and ready for final inspection.
12. Submit certification stating equipment and systems having been tested in presence of Owner's representative and are fully operational.

B. Within 2 weeks after receipt of the request for Final Acceptance from the Contractor, the Architect will inspect to determine status of completion.

1. Should the Engineer determine that the Work is incomplete or defective:

    a. The Engineer will notify the Contractor in writing, stating the reasons listing the incomplete or defective work.
    b. Take immediate steps to remedy the deficiencies and send a second written notice of request for Final Acceptance to the Engineer.
    c. Costs relative to the Engineer re-inspection due to failure of work to comply with claims made by the Contractor, will be compensated by the Owner, who will deduct the amount of such compensation from the Final Payment due to the Contractor.

C. After the Engineer finds the work required under this Contract acceptable, the Engineer will review the final closeout submittals.

D. Application for Final Payment: Submit Application for Final Payment in accordance with procedures and requirements of the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.

1. The Engineer will prepare a Final Change Order, reflecting approved adjustments to the Contract Sum not previously made by other Change Orders.

1.4 PROJECT RECORD DOCUMENTS

A. Submit prior to request for Certificate of Final Acceptance.

B. Maintain a clean, undamaged set of and shop drawings for preparing the record drawings.

1. Where shop drawings are used, record a cross-reference at the corresponding location on the Contract Documents.

C. Do not use Record Documents for construction purposes; protect from loss in a secure location. Mark-up these drawings to show the actual installation reflecting all changes made in the Work during construction.

1. Mark whichever drawing is most capable of showing conditions accurately.
2. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
3. Record new information that is important to the Owner, but was not shown on the shop drawings.

E. The Engineer may periodically inspect these record drawings, and their proper maintenance may be a condition precedent to approval of applications for periodic payments.

F. Deliver all Project Record Documents, shop drawings, product data, and samples to the Engineer for the Owner's use, upon completion of the Work and prior to request for Final Acceptance of the Work.

G. In addition, prepare at the completion of the work, neat, clean well drafted, and complete record drawings in the form of reproducible mylars. Submit these reproducible Project Record Documents to the Engineer as a condition precedent to final payment, and include documents prepared by the mechanical and electrical trades.

1.5 OPERATING AND MAINTENANCE MANUALS

A. Deliver to an on-site location designated by the Owner, four (4) bound and properly identified Operating and Maintenance Manuals prior to request for Final Acceptance.

1. Manuals shall be in 8-1/2 by 11 inch pages and bound in three "D-ring" capacity binders with durable plastic covers. Internally subdivide the binder contents with permanent page dividers and logically organized.
2. Each manual shall include the same following minimum information:

a. Table of Contents
b. Directory of Contractor, subcontractors, major equipment supplies and Architect listing addresses and phone numbers.
c. Operation and maintenance instructions for electrical systems.
d. Maintenance and cleaning instructions for finishes.

e. Product and manufacturer's Certificates
f. Individually-notarized photocopies of all warranties and bonds.

3. Submit one copy of completed volume in final form 21 days prior to final inspection. This copy will be returned after final inspection with Architect comments. Revise and submit all volumes to the Owner.

1.6 WARRANTIES

A. Furnish a notarized copy of the full one-year warranty for all work, with validity commencing on the date of Substantial Completion of the Contract, as defined in the GENERAL CONDITIONS.

B. Provide duplicate notarized copies of extended warranties specified in individual Specifications SECTIONS for all copies of operations and maintenance manuals.

1.7 SPARE PARTS AND MAINTENANCE MATERIALS

A. Deliver, to on-site location designated by the Owner, all spare parts, maintenance materials, and additional materials; belts and filters; and obtain receipt from the Owner prior to request for certification of final acceptance.

END OF SECTION

ELECTRICAL TRADE CONTRACT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. The Electrical Work includes the Work specified in the following Sections:
   1. 011100, 012300, 013100, 013300, 01500, 017329, 017700, 260500, 260519, 260526, 260529, 260533, 260516, & 263353.

B. The Work is shown on the following drawings: NANTUCKET PUBLIC SAFETY BUILDING – DATA CENTER UNINTERRUPTIBLE POWER SUPPLY, Northampton, MA
   E1.0 ELECTRICAL FLOOR PLAN & RISER
   1. The Electrical Contractor will “act” as the General Contractor. The Electrical Systems Contractor shall perform all the requirements of the General Contractor for this project.

PART 2 - PRODUCTS

A. Not Used.

PART 3 - EXECUTION

A. Not Used.

END OF SECTION 260000

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.02 GENERAL DESCRIPTION

A. Provide all materials and labor for the installation of new generators, transfer switches, distribution panels as well as branch circuit and remote panelboards as indicated on the electrical drawings.

B. The work shall be subject to the terms and conditions contained in the "Construction Contract," agreement between the Contractor and the Owner. A Performance Bond will be required at the Contractor's expense and is required to be included in the Contractor's bid.

C. All work shall be performed in accordance with these specifications and good practice. No modifications to these specifications will be accepted without the expressed written approval of the Owner. It is the Contractor's responsibility to document Owner's approval of any such modifications prior to the execution of work

D. Contractor shall field verify all information contained on the contract drawings and is responsible for the detailed design and installation of the system in accordance with the specifications. The contract drawings do not show all information necessary for installation of the system, but are intended to be used by the Contractor for the purpose of providing detailed design of the system and preparing a bid. As such, they indicate:

1. Approximate device locations. Field-coordinate exact locations with Engineer and the Owner in the general area shown on drawings.
2. Types and quantities of equipment.
3. Location of the new switchgear and other electrical equipment.
4. Location of electrical equipment to be in new closets.

E. When open-flame or spark producing tools such as blower torches, welding equipment, and the like are required in the process of executing the work, the Owner shall be notified not less than twenty four hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed and until it is completed.

1.03 INTENT OF SPECIFICATIONS

A. It is intended that the work performed pursuant to these specifications be complete in every respect, resulting in a system installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and Underwriters Laboratories Inc. (UL) listings.

B. It is further intended that upon completion of this work, the Owner be provided with:

1. Complete information and drawings describing and depicting the entire system as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system at a future date.
2. Complete documentation of system testing.
3. Certification that the entire system has been inspected and tested is installed entirely in accordance with the applicable codes, standards, manufacturer's recommendations and UL listings, and is in proper working order.

1.04 WORK TO BE PERFORMED

A. Work described herein shall be interpreted as work to be done by the Electrical Contractor. The Electrical Contractor is the General Contractor as one and the same. When reference is made to Electrical Contractor it shall mean General Contractor and vice versa.

B. Provide all labor, materials, tools, and equipment, including scaffolding, to complete the installation of the system. Install, equip, adjust, and put into operation the respective portions of the installation specified, and so interconnect various items or sections of work in order to form a complete and operating whole. Systems may be referenced in singular or plural terms, also refer to drawings to confirm quantities. The work shall consist of, but shall not necessarily be limited to, the following:

1. Install new UPS (Uninterruptible Power Supply) and modify existing battery cabinet.
2. Modify existing panelboard, provide new circtuit breakers, feeders, and sub-feeders.
3. All raceway systems, including boxes, couplings, and fittings.
4. Branch circuit wiring.
5. All testing of equipment installed.
6. Any other item of work hereinafter specified or indicated on electrical drawings.
7. Drilling, coring, cutting and patching of holes for electrical conduit, systems, and equipment.
8. Systems Identification.
9. Scaffolding, Rigging, and Staging required for all Work.
10. Fire stopping shall be performed by this contractor.
11. Hoisting and rigging of UPS.

1.05 COORDINATION DRAWINGS FOR EQUIPMENT LAYOUT.

A. Modifications to existing switchboard, secondary distribution equipment including remote panels designated and feeders. The Contractor shall provide necessary grouting, patching and painting to match existing finishes. Repair all surfaces to as new condition.

B. Install the new system in phases. The existing system shall remain in operation during construction. Coordinate any cutover or power outages with the Owner.

C. Extended power outages (4 hours or more) shall be scheduled with the Northampton Department of Public Works and will require a temporary generator provided by the contractor. The contractor shall include 1 week of temporary generator in bid for back-up of existing facility. The temporary generator shall be sized for 500 KW minimum at 277/480, 3 phase, 4 wire.

D. Coordinate all work with other Subcontractors and Owner working in the building on concurrent construction/remodeling or installation of other systems.

E. Submit a phased construction schedule to be reviewed by Owner prior to start of construction.

F. Special attention shall be given to the architecture of the building so as to minimize surface electrical wiring and conduits in public areas, labs and assembly spaces. Conceal all conduits where possible. Use existing thru-wall and thru-floor sleeves where possible.

G. The work schedule will need to be coordinated with the owner.

H. All conduits, when run exposed out of necessity, within public spaces, shall be painted grey. Coordinate exact color with owner. Obtain approval from Owner/Engineer for exposed conduits in public spaces prior to roughing in.

1.06 DEFINITIONS

A. Most terms used within the documents are industry standard. Certain words or phrases shall be understood to have specific meanings as follows:

1. Provide: Furnish and install completely connected up and in operable condition.
2. Furnish: Purchase and deliver to a specific location within the building or site.
3. Install: With respect to equipment furnished by others, install means to receive, unpack, move into position, mount and connect, including removal of packaging materials.
4. Conduit: Raceways of the metallic type which are not flexible. Specific types as specified.
5. Connect: To wire up, including all branch circuitry, control and disconnection devices so item is complete and ready for operation.
6. Subject to Mechanical Damage: Equipment and raceways installed exposed and less than eight feet above finished floor in mechanical rooms or other areas where heavy equipment may be in use or moved.
7. Electrical Contractor: Shall mean General Contractor as one and the same.
8. Architect: Shall mean Engineer as one and the same.

1.07 ITEMS TO BE FURNISHED ONLY

A. Furnish the following items for installation under designated sections.

1. None

1.08 ITEMS TO BE INSTALLED ONLY

A. Install the following items furnished under designated sections.

1. None.

1.09 RELATED WORK

A. The following related work is to be performed under designated sections.

1. None.

1.10 CONTRACT COST BREAKDOWN

A. Submit a breakdown of contract price to aid Owner in determining value of work installed as job progresses.

B. Provide breakdown of schedule of values per Category of work. Include separate line items for material and labor amounts.

1.11 INSPECTION OF SITE

A. All Electrical bidders are strongly encouraged to attend the walk-thru to inspect site prior to submitting bid. Failure to inspect existing conditions or to fully understand work which is required shall not excuse Electrical Subcontractor from his obligations to supply and install work in accordance with specifications and the drawings and under all site conditions as they exist.

1.12 CONTRACTOR'S REPRESENTATIVE

A. Retain a competent representative on the project.

1.13 COOPERATION

A. Work shall be carried on under usual construction conditions, in conjunction with other contractors work. Cooperate with other contractors, coordinate work and proceed in a manner as not to delay progress.

B. Before proceeding, examine all construction drawings and consult other contractors to coordinate installation and avoid interference.

C. In case of dispute, the Architect/Engineer will render a decision in accordance with General and Supplementary General Conditions.

1.14 CODES, ORDINANCES, AND PERMITS

A. Codes and Ordinances:

1. All material and work provided shall be in accordance with the following codes and standards as most recently amended.

   Commonwealth of Massachusetts Building Code
   Massachusetts Electric Code, 2014 Edition
   State Department of Public Safety
   NFPA 101 "Life Safety Code"
   NFPA Standards
   NFPA 110 - Standard for Emergency and Standby Power Systems
   Standards of the Underwriters Laboratories (UL)
   Occupational Safety and Health Act (OSHA)
   Americans with Disabilities Act (ADA)
   Energy Conservation Code
   Town of Nantucket

2. Where contract documents indicate more stringent requirements than codes, the contract documents shall take precedence.

B. Permits: Be responsible for filing documents, pay all permit fees, and securing of inspection and approvals

1.15 ELECTRICAL ROOMS OR SPACES

A. Be responsible for ensuring that the dedicated space and clearances required in the NEC, Section 110-26 are maintained for all electrical equipment.

1.16 SUBMITTALS

A. Refer to Supplementary General Conditions for information relative to submission of shop drawings. Six (6) copies are required. No equipment shall be installed prior to review, except at Contractor's own risk.

B. Notwithstanding any restrictions upon contractor proposed substitutions, should apparatus or materials be permitted by Architect/Engineer to be substituted for those specified for good cause, and such substitution necessitates changes in or additional connections, piping, supports, or construction, same shall be provided. Assume cost and entire responsibility thereof.

1.17 GUARANTEE

A. Keep work in repair without expense to Owner as far as concerns defects in workmanship or materials for a period of not less than one year from date of substantial completion.

1.18 WORKING CONDITIONS

A. It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed. Inspection of the building may be made by appointment with the Owner.

B. The Contractor will be responsible for attending a pre construction meeting and weekly construction coordination meetings with the Owner, and preparing minutes of these meetings. Construction coordination meetings will be scheduled by the Owner. The frequency of required meetings may be decreased, at the Owner's option, if warranted by the progress of the project.

C. All work of this contract is to be conducted between 7 A.M and 5 PM. Monday thru Friday, except the Contractor, at his option, may work between the hours of 5 P.M, and 11 P.M. where approved by the Nantucket Department of Public Works.

D. The Contractor shall be responsible for prior coordination of all work and demolition with the Owner.

E. In return for progress payments, less retainage, made to the Contractor by the Owner during the course of the work, the Owner shall assume title to all new systems, equipment, and devices as they are delivered to the job site, installed and put into service.

1. Assumption of title for new systems, equipment, and devices by the Owner shall not imply acceptance of those systems, equipment, and devices by the Owner nor shall it relieve the Contractor from his obligation to meet all requirements of these Specifications.
2. The Owner reserves the right to make beneficial use of all new systems, equipment and devices, as those systems, equipment and devices are put into service, throughout the installation period. Such beneficial use shall not imply acceptance of those systems, equipment and devices by the Owner, nor shall it relieve the Contractor from his obligation to meet all requirements of these Specifications. Beneficial use of the system shall not cause the warranty period to begin prior to the Owner's final acceptance.

F. Assistance provided by Building Personnel to the Contractor, at the Contractor's request, shall be at cost to the Contractor, via back-charge, equal to the Owner's cost for those personnel for the time required. All such assistance shall be subject to the prior, written approval from the Owner and shall not constitute or imply direction or approval to the Contractor on behalf of the Owner.

1.19 QUALITY ASSURANCE

A. Codes, Standards, Ordinances, and Permits

1. All work shall conform to the requirements of the applicable portions of the National Fire Protection Association (NFPA) Standards, Guides and Recommended Practices listed herein as most recently ammended:

B. NFPA 70 - 2011, National Electrical Code (as modified by the State of Massachusetts).

C. NFPA 72 - 2010, National Fire Alarm Code.

D. Final Rule of the Americans with Disabilities Act (ADA) - Public Law 101-336 with ADA Amendments Act of 2008

E. NFPA 110 – 2005, Standard for Emergency and Standby Power Systems.

1. All work and materials shall conform to all Federal, State and local codes and regulations governing the installation, including the current editions of the Massachusetts State Building and Fire Prevention Codes, as modified or interpreted by the City of Northampton officials to permit use of current NFPA standards.
2. If there is a conflict between the referenced NFPA standards, federal, state or local codes, and this specification, it is the Contractor's responsibility to immediately bring the conflict to the attention of the Owner for resolution. NFPA standards shall supersede unless local codes are more stringent. Contractor shall not attempt to resolve conflicts directly with the local authorities unless specifically authorized by the Owner.
3. All devices, systems, equipment and materials furnished and installed shall be new and listed by Underwriters Laboratories Inc. (UL) for their intended use. All equipment shall be installed in accordance with the manufacturer's recommendations and the UL listing limitations.

F. Contractor Qualifications:

1. The Contractor shall:

a. Hold all licenses and permits necessary to perform this work.
b. Have at least five years of experience in the installation of systems of this type and be familiar with all applicable local, state and federal laws and regulations.
c. Have worked on one or more large, retrofit projects in the last five years.
d. Provide a job site supervisor who is to be present on-site each day that work is actively in progress. This individual shall be the same person throughout the course of the project.

1.20 TEMPORARY ELECTRICAL SUPPORT FACILITIES

A. Provide own field office and/or storage facilities which shall be located as directed by the Owner and in accordance with local regulations. Provide all tools, equipment, ladders, and temporary construction required for execution of the work.

B. All scaffolding, ladders, and other temporary construction shall be rigidly built in accordance with all local and state requirements, and shall be removed upon completion.

1.21 INSPECTIONS AND TESTS

A. Inspection: If inspection of materials installed shows defects, such defective work, materials, and/or equipment shall be replaced and inspection and tests repeated.

B. Tests: Make reasonable tests and prove integrity of work and leave installation in correct adjustment and ready to operate.

1.22 RECORD DRAWINGS

A. The Contractor shall provide and maintain on the site an up-to-date record set of approved shop drawing prints which shall be marked to show each and every change made to the fire alarm system from the original approved shop drawings. This shall not be construed as authorization to deviate from or make changes to the shop drawings approved by the Architect/Engineer without written instruction from the Architect/Engineer in each case. This set of drawings shall be used only as a record set. These drawings shall be made available to the Architect/Engineer, or their representative, upon request.

B. Upon completion of the work, the record set of prints shall be used to prepare complete, accurate final record drawings reflecting any and all changes and deviations made to the drawings.

C. The contractor record drawings are required to show and to identify quantities of junction boxes, spare conductors, color coding of conductors, splices, device backboxes, and terminal strips. These drawings shall include a schedule of all connections/terminations, indexed by junction box, device backbox and terminal strip and shall reference wire identification taped numbers as installed.

D. Provide contract record drawings on diskette in AutoCAD Release Version 2012 or later format.

E. Software Documentation

1.23 DOCUMENTATION OF SOFTWARE MODIFICATIONS SHALL INCLUDE:

A. A complete printout of the system program prior to the change.

B. A complete printout of the system program subsequent to the change, with all modifications highlighted.

C. A letter prepared and signed by the individual who made the changes, describing each change made, and the reason for that change. This letter shall certify that the preparer has personally reviewed and compared the before and after program printout and verified the correctness of the modification(s).
   1. A copy of all software documentation required by this section shall be maintained on-site by the Contractor, in a binder, arranged in chronological order. This binder shall be turned over to the Architect/Engineer at the completion of the project.

1.24 WARRANTY

A. Warranty Period:

   1. The Contractor shall warranty all materials and workmanship during the installation period and for a period of one year, beginning with the date of final acceptance by the Owner. The Contractor shall be responsible during the design, installation, testing and

warranty periods for any damage caused by him or his subcontractors or by defects in his or his subcontractors' work, materials, or equipment.

1.25 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

A. The Contractor shall provide the Architect/Engineer with a loose-leaf manual for review and approval containing:

1. A detailed description of the operation of the system, including operator responses. The approved sequence of operation shall be placed in, or adjacent to, the operator's control panel.
2. A detailed description of routine maintenance required or recommended or as would be provided under a maintenance contract including a testing and maintenance schedule and detailed testing and maintenance instructions for each type of device installed.
3. Manufacturers' data sheets and installation manuals/instructions for all equipment installed with detailed troubleshooting instructions.
4. A list of recommended spare parts.
5. Service directory which includes the main emergency service number.
6. Small scale (11 inches by 17 inches) contractor record drawings of the system.

B. Within 90 days of authorization to proceed, the Contractor shall submit to the Architect/Engineer four (4) copies of the draft manual for approval.

C. Thirty (30) days prior to completion of the work, six (6) copies of the approved manual shall be delivered to the Owner.

D. This manual shall be written, compiled and edited specifically for this project and the system installed. Unedited manufacturer's catalog data sheets and/or equipment manuals are unacceptable as content for this submittal.

E. Provide Owner personnel with one (1) four hour training sessions after completion of project. Coordinate with Owner.

1.26 RETURN AIR PLENUM

A. All wiring systems in areas above hung ceiling shall either be run in conduit or shall be "UL listed" plenum cable

1.27 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

A. During the execution of the work, required relocation, rerouting, etc., of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Contractor, as required by job conditions and as determined by the Architect in the field, to facilitate the installation of the new system, while demolition, relocation work or new tie-ins will be performed. Outages required for construction purposes shall be scheduled for the shortest practical periods of time, in coordination with the Owner's designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the Owner's working schedule, as many times as required until all work is complete. Any outages of service shall be approved by the Owner, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Owner prior to commencing the work. Give notice of any scheduled shutdowns, minimum of (2) weeks in advance. Owner shall make their best effort to meet this request without adversely affecting the electric service to the existing building.

B. Prior to any deactivation and relocation or demolition work, consult the drawings and arrange a conference with the Architect and the Owner's representative in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect all equipment designated to be relocated and reused or to remain in operation and be integrated with the new systems.

C. Where existing outlets are to be reused and are cut off by the remodeling, they shall be reconnected to existing circuits as required by field conditions. Where existing outlets are to be abandoned, they shall be removed and blank plates installed. Each bidder shall, before submitting his bid, visit the site and make a thorough examination of the conditions in the existing buildings in order to determine the extent of the work to be done.

D. All deactivation, relocation and temporary tie-ins of electrical systems and equipment shall be provided by the Electrical Contractor. All demolition and removal of electrical systems and equipment designated to be demolished shall be by the Electrical Contractor.

E. Phasing

1. The Electrical Contractor shall construct the subject in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Furnish products by one of the named manufacturers, or submit a formal, written request for Substitution in accordance with procedures described in Division 1.
1. If a substitution is accepted by the Architect, provide redesign of electrical and mechanical work which is required to accommodate the substituted product, subject to approval by Engineer.

B. Furnish all equipment of one type (such as panelboards and disconnect switches) from a single manufacturer.

2.02 MATERIALS, GENERAL

A. Material and equipment shall meet requirements of the latest Standards of NEMA, UL, ICEA, ANSI and IEEE.

B. Colors: When shop-finished equipment is exposed to view in public areas (areas other than electrical or mechanical rooms), Architect will select color from equipment manufacturer's standard color options.

2.03 MISCELLANEOUS MATERIALS

A. Access Panels: Furnish panels specified in Division 8.

B. Conduit Sleeves:

1. Sleeves through unrated walls and floors: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel.
2. Sleeves through fire-rated partitions and floors: 10 gauge galvanized steel.

C. Steel Channels (for equipment supports): Mild steel channels as manufactured by Unistrut, Kindorf or Husky Products Company; equal to Unistrut “P1000.”

D. Non-metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.04 FIRESTOPPING MATERIALS

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

D. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to:

1. Hilti, Inc.
2. BioFireshield; RectorSeal Corporation.
3. 3M; Fire Protection Products Division.
4. WR Grace and Co.; FlameSafe, equal products.
5. Or approved equal.

PART 3 - EXECUTION

3.01 WORK COORDINATION AND JOB OPERATIONS

A. Equipment shall not be installed in congested and possible problem areas without first coordinating installation of same with other trades. Relocate electrical equipment installed in congested or problem areas should it interfere with the proper installation of equipment to be installed by other trades.

B. Particular attention shall be directed to coordination of lighting fixtures and other electrically operated equipment requiring access which is to be installed in ceiling areas. Coordinate with other trades, the elevations of equipment in hung ceiling areas to insure adequate space for installation of equipment before said equipment is installed. Conflicts in mounting heights and clearances above hung ceilings for installation of equipment requiring access shall be brought to the attention of Architect for a decision prior to equipment installation.

C. Furnish to other subcontractors information relative to portions of electrical installation that will affect other trades sufficiently in advance so that they may plan their work and installation.

D. Obtain from other trades information relative to electrical work which he, the Electrical Contractor, is to execute in conjunction with installation of other trades' equipment.

3.02 PLANS AND SPECIFICATIONS

A. Plans:

1. Within 30 days of authorization to proceed, provide Coordination Drawings showing layout of electrical systems and indicate approximate location of raceways, outlets, and all other apparatus. Final determination as to routing shall be governed by structural conditions Architect/Engineer to review Coordination Drawings prior to the onset of Construction.

B. Specifications:

1. Specifications supplement drawings and provide specifics pertaining to methods and material to be used.

3.03 IDENTIFICATION

A. Equipment shall be marked for ease of identification as follows.

1. Provide screw-on nameplates on F.A. terminal cabinets. Nameplates to be of black phenolic with white engraving. For starters and disconnect switches lettering shall be minimum of 1/4" high. Nameplates on panelboards shall have the following information.

a. Line 1 - Panel designation in 1/2" high letters.
b. Line 2 - Utilization voltage in 3/8" high letters.
c. Line 3 - Distribution source "Fed from " in 1/4" high letters.

2. Color coding schedules. If there is more than a single system voltage, different voltages shall have separate color codes, as previously specified. A copy of the color code schedule shall be affixed to each secondary switchboard and distribution panel and shall be of the phenolic nameplate type as previously specified. A typewritten color code schedule shall also be affixed, under plastic, inside each panelboard door.

3. Outlet boxes both concealed and exposed shall be identified as to panel origination and circuit number by means of fibre pen on the inside of coverplate.
4. Special system outlet boxes concealed above hung ceilings shall be identified as to system by spray painting during roughing. The following systems shall be identified.

   a. Fire Alarm - red.
   b. Normal/Emergency - yellow.

5. Wiring device plates on devices connected to normal-emergency circuits shall be red in color.
6. All conductors in boxes larger than standard outlet boxes, in all wireways, trench headers, etc. shall be grouped logically and be identified.
7. Grounding conductors and neutrals shall be labeled in panels, wireways, etc. as to circuits associated with.

3.04 PROTECTION AND CLEANUP

A. Protection:

1. Materials and equipment shall be suitably stored and protected from weather.
2. During progress of work, pipe and equipment openings shall be temporarily closed so as to prevent obstruction and damage.
3. Be responsible for maintenance and protection of material and equipment until final acceptance.

B. Cleanup:

1. Keep job site free from accumulation of waste material and rubbish. Remove all rubbish, construction equipment, and surplus materials from site and leave premises in a clean condition.
2. At completion, equipment with factory finished surfaces shall be cleaned and damaged spots touched up with the same type paint applied at factory.
3. Particular attention is called to Section 110-12(c) of the NEC, which requires that internal parts of electrical equipment not be contaminated by construction operations.

3.05 PORTABLE OR DETACHABLE PARTS

A. Retain possession of and be responsible for spare parts, portable and detachable parts, and other removable portions of installation including fuses, keys, locks, blocking clips, inserts, lamps, instructions, drawings, and other devices or materials that are relative to and necessary for proper operation and maintenance of the system until final acceptance, at which time such parts shall be installed or turned over to the Owner, as the case may be. All devices, keys, etc. to be labeled as to identify what function they perform, and where the item will be used. Provide cross reference chart and instructions to Owner's personnel as required.

3.06 SAFETY PRECAUTIONS

A. Provide proper guards, signage, and other necessary construction required for prevention of accidents and to insure safety of life and property. Remove any temporary safety precautions at completion.

3.07 MOUNTING HEIGHTS

A. All electrical equipment shall be mounted at the following heights unless noted or detailed otherwise on drawings. Notes on architectural drawings shall supersede those noted below or

detailed on the electrical drawings. If mounting height of an electrical component is questionable, obtain clarification from Architect/Engineer before installation.

1. Duplex convenience outlets, microphone outlets, and telephone/data outlets - 18 inches.
2. Fire alarm pull stations - 48 inches.
3. Fire alarm audio visual signals - 80 inches or 6 inches below ceiling to center of visual device, whichever is lower.

B. Mounting heights given are from finished floor to centerline. In the case of a raised floor, surface of raised floor is the finished floor.

3.08 WORKMANSHIP AND INSTALLATION METHODS

A. Work shall be installed in first-class manner consistent with best current trade practices. Equipment shall be securely installed plumb and/or level. Flush-mounted outlet boxes shall have front edge flush with finished wall surface. No electrical equipment shall be supported by work of other trades. Cable systems shall be supported and not draped over ducts and piping or laid on ceiling suspension members.

B. Supports:

1. Support work in accordance with best industry practice and by use of standard fittings.
2. In general, walls and partitions will not be suitable for supporting weight of panelboards, and the like. Provide supporting frames or racks extending from floor slab to structure above.
3. Provide supporting frames or racks for equipment, intended for vertical surface mounting in free standing position where no walls exist.
4. No work for exposed installations in damp locations shall be mounted directly on any building surface. In such locations, flat bar members or spacers shall be used to create a minimum of 1/4" air space between building surfaces and work.
5. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric raceways or cables for support. All outlet, pull, and junction boxes shall be independently supported.
6. Nothing shall rest on, or depend for support on, suspended ceiling or its mounting members.
7. Support metallic raceways by either running within steel frame or hung from the building frame. Anything hung from building frame shall be attached with metallic fasteners.

C. Fastenings:

1. Fasten electric work to building structure in accordance with the best industry practice.
2. Where weight applied to attachment points is 100 pounds or less, fasten to building elements of:

    a. Wood -- with wood screws.
    b. Concrete and solid masonry -- with bolts and expansion shields.
    c. Hollow construction -- with toggle bolts.
    d. Solid metal -- with machine screws in tapped holes or with welded studs.

3. Where weight applied to attachment points exceeds 100 pounds, fasten as follows:
    a. At field poured concrete slabs, provide inserts with 18" minimum length slip-through steel rods, set transverse to reinforcing steel.
    b. Where building is steel framed, utilize suitable auxiliary channel or angle iron bridging between structural steel elements to establish fastening points. Bridging members shall be suitably welded or clamped to building steel. Provide threaded rods or bolts to attach to bridging members.

4. Floor mounted equipment shall not be held in place solely by its own dead weight. Provide floor anchor fastenings. Floor mounted equipment over 72 inches in height shall also be braced to nearest wall or overhead structural elements.
5. For items which are shown as being mounted at locations where fastenings to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging to building structural elements.
6. Fastenings for metallic raceways using the fastening as support shall be of the metallic type. Fastenings to hold raceways or cables in place may be via tyraps.

D. General Raceway Installation:

1. Install the various types of raceways in permitted locations as previously specified. All raceways shall be run concealed. Consult Owner for instruction for raceways which must be exposed in public spaces.
2. Raceways shall be properly aligned, grouped, and supported in accordance with code. Exposed raceways shall be installed at right angles to or parallel with structural members. Concealed raceways may take most direct route between outlets.
3. Raceways run on trapeze hangers shall be secured to the trapeze.
4. Raceways shall be continuous and shall enter and be secured to all boxes in such a manner that each system shall be electrically continuous from service to all outlets. Provide grounding bushings and bonding jumpers where raceways attach to painted enclosures or terminate below equipment.
5. Where raceways enter boxes, cabinets, tap boxes, other than those having threaded hubs, a standard locknut shall be used on the outside and locknut and bushing on the inside.
6. Where raceways terminate below equipment and there is no direct metal to metal continuity, provide grounding bushings on raceways and interconnect with equipment grounding conductor.
7. All empty raceways shall be provided with a pull wire.
8. All raceway sleeves, stub-ups, or stub-outs, where not connected to a box or cabinet, shall be terminated with a bushing.
9. All raceway joints shall be made up tight and no running threads will be permitted.
10. Where raceways are cut, the inside edge shall be reamed smooth to prevent injury to conductors.
11. All vertical raceways passing through floor slabs shall be supported.
12. Raceways shall not be installed in concrete slabs above grade or below waterproofed slabs.
13. Electric raceways and/or sleeves passing through floors or walls shall be of such size and in such location as not to impair strength of construction. Where raceways alter structural strength or the installation is questionable, the structural engineer shall be contacted for approval.
14. Raceways shall not run directly above or below heat producing apparatus such as boilers, nor shall raceways run parallel within 6 inches of heated pipes. Raceways crossing heated pipes shall maintain at least a 1 inch space from them.
15. Raceways shall be installed in such a manner as to prevent collection of trapped condensates, and all runs shall be arranged to drain.
16. Raceways passing between refrigerated and non-refrigerated spaces and those penetrating enclosures with air movement shall be provided with seals.
17. Where two alternate wiring methods interconnect such as EMT to flexible metal conduit, an outlet box shall be provided.
18. Elbows and extensions of rigid non-metallic raceway systems which penetrate slabs shall be rigid or intermediate metal conduit.

E. Conductor Installation:

1. No conductors shall be pulled into individual raceways until such raceway system is complete and free of debris. No harmful lubricants shall be used to ease pulling.
2. All conductors shall be wired so that grounded conductor is unbroken; switches in all cases being connected in ungrounded conductor.
3. Connections throughout the entire job shall be made with solderless type devices of approved design satisfactory to Inspector of Wires.
4. All taps and splices shall be insulated equal to that of conductor insulation.
5. All conductors of each feeder in pull boxes etc. shall be grouped, tied together, supported, and identified.
6. All conductors in panelboards and other wiring enclosures shall be neatly formed and grouped.
7. All conductors of emergency only and/or normal/emergency shall be run in separate raceway systems to final outlet box.
8. Provide support for conductors in vertical raceways in accordance with Article 300-19.
9. Strip insulation from conductors with approved tools and only of sufficient length for proper termination. Cutting of conductor stranding is unacceptable.
10. Taps from paralleled conductors shall be of a type which tap each conductor, such as ILSCO "PTA" series.
11. Grounding conductors are to be identified as to associated power circuits.

F. Type MC Cable Installation:

1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:

    a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Horizontally run cable supports such as Caddy WMX-6, and clamps on vertical runs such as Caddy CJ6 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will also be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of types specifically designed for use with cable, i.e., romex connectors not acceptable.
    b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek Co., not with hacksaw.
    c. Use split "insuliner" sleeves at terminations.
    d. Any cable system used in conjunction with isolated ground circuits shall have both an isolated ground conductor and an equipment ground conductor.

G. Stranded Conductor Installation:

1. If Contractor selects stranded conductors for # 10 AWG and smaller, terminate such conductors as follows:

    a. No stranded conductor may be terminated under a screwhead. Provide insulated terminal lugs for all screw connections equal to Thomas & Betts "STA-KON" type RC with forked tongue and turned up toes. Installation of lugs shall be done with compression tool such as T&B WT-145C which prevents opening of tool until full compression action is completed.
    b. Backwired wiring devices shall be of clamp type; screw tightened. Force fit connections not allowed.
2. Stranded conductors will not be allowed for fire alarm work.

H. Accessibility:

1. Electrical equipment requiring service or manual operation shall be accessible.

2. Work switches for equipment within accessible hung ceiling spaces, such as fan powered terminal boxes, shall be located at terminal box, and so located so as to be accessible.

I. Vibration Elimination:

1. All equipment connections to rotating equipment or equipment capable of vibration shall be made up by flexible raceways.

J. Wiring Device Gaskets:

1. Provide wiring device gaskets at coverplates where device is mounted in wall separating conditioned and non-conditioned spaces.

3.09 FIREPROOFING AND WATERPROOFING

A. Fireproof and waterproof all openings in slabs and walls.

B. Examination:

1. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Preparation:

1. Surface Cleaning: Clean joints and openings immediately before installing firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

a. Remove from surfaces of joint and opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
b. Clean joint and opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
c. Remove laitance and form-release agents from concrete.

D. Through-Penetration Firestop System Installation:

1. General: Install through-penetration firestop systems to comply with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
2. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce crosssectional shapes and depths required to achieve fire ratings indicated.
3. Install fill materials for firestop systems by proven techniques to produce the following results:
   a. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   b. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   a. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.10 CUTTING AND PATCHING

A. All cutting of surfaces, including core drilling of walls and slabs, shall be done by Electrical Contractor. Patching, finish painting and new wall coverings shall be completed by the Electrical Contractor to as new condition. Perform work in such a manner as to minimize patching, painting or wall covering replacement.

3.11 DISTRIBUTION EQUIPMENT TESTING

A. All motor controls, feeder conductors, and emergency systems shall be tested in accordance with the following. In general, all tests shall be done in accordance with the 1995 Acceptance Testing Specifications of the International Electrical Testing Association.

B. The Testing Subcontractor may be an independent contractor or a manufacturer of the equipment, which is to be tested.

C. Test report forms, delineating tests to be made, and method of recording same shall be submitted prior to commencing work. Test reports when submitted shall include interpretation of results and recommendation for any corrective work required.

D. Conductors: All secondary service conductors and all feeder conductors from switchboards and distribution panels shall be tested.

1. Visual and mechanical inspection: Conductors to be inspected for physical damage and proper connection and sizing in accordance with single line diagram.
2. Conductor connections shall be torque tested to manufacturer's recommended values.
3. Electrical Tests: Perform insulation resistance test on each conductor with respect to ground and adjacent conductor.
4. Perform continuity test to insure proper conductor connection.

E. Require trades providing equipment bases and pads, curbs, chases, pockets and openings (except core drilling) to coordinate dimensions with actual dimensions of equipment furnished under this section. Furnish to other trades required dimensions, templates, bolts, and anchors for support or attachment of electrical work.

F. Prior to installation, coordinate the exact mounting arrangement and location of equipment indicated on the drawings to allow proper space requirements as indicated in the Electrical Code. If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

G. Do not allow equipment or piping foreign to the electrical installation to be installed or pass through electric rooms, electric closets, telephone or data closets, except as approved by the Architect.

H. Arrange for chases, slots and openings in other building components during progress of construction, to allow for electrical installations.

I. Comply with NECA 1.

3.12 CORING AND SLEEVES

A. Electrical Contractor shall be responsible for all core drilling required for his work, but in no case shall the Contractor cut into any structural elements without the written approval of the Architect.

B. Where conduits pass through masonry or concrete walls, foundations, or floors, set such sleeves as are necessary for passage of the conduits. Sleeves shall be of sufficient size to provide air space around the conduit passing through. Electrical Contractor shall be responsible for the exact location of sleeves provided under this Contract.

C. Make watertight conduit which passes through exterior walls and floors below grade. Provide sealant and pipe sleeves with wall collar located at the center of the wall extending 8 inches all around the conduit. Collar shall be 1/8 inch thick steel welded to sleeve. Coordinate material requirements with General Contractor.

D. Do not install sleeves or inserts in any portions of the building where their use would impair strength or construction features of the building. Elimination of sleeves must be approved by Architect.

E. Conduit sleeves:

1. Use sleeve at least 2 inches larger in diameter than the conduit passing through it.
2. Set sleeves securely in place before concrete is poured.
3. Set sleeves 1 inch above finish floor and flush on each side of walls, except sleeves through floor occurring in walls and partitions shall terminate flush with finish floor.

3.13 DEMONSTRATION

A. Instruct the Owner's representative in the proper operation of all systems and equipment provided, prior to the final acceptance of his work. Make arrangements with the Owner, who will designate the person or persons who will be instructed in the operation of the basic and auxiliary electrical systems. The Owner shall be satisfied that instruction has been thorough and complete before final payment is made, or the Electrical Contractor shall provide additional instruction.

3.14 TESTING AND INSPECTION

A. Test and inspect all parts of the work provided under this Contract, and as required by codes, standards or authorities having jurisdiction. Conduct all tests and inspections to the complete satisfaction of the Architect and the authorities. Notify the Architect and the authorities at least 48 hours prior to testing or inspection. Do not cover work prior to testing or inspection.

B. All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects, and shall show an insulation resistance between phase conductors and ground of not less than the values recommended by the manufacturers.

C. Promptly correct failures and defects in workmanship or materials revealed by tests or inspection, and retest. Replace defective material at no additional expense to the Owner.

D. Prepare systems for testing and protect from damage during testing. Provide all temporary connections, necessary testing equipment, labor and materials, required for the testing of the systems and equipment.

E. Verify and correct as necessary the following: Voltages, tap settings, trip settings, and phasing on all equipment from the secondary distribution system to points of utilization. Test secondary voltages at the bus in the main switchboard, at panelboards, and at such other locations on the distribution systems as necessary. Test secondary voltages under no-load and full-load conditions.

3.15 CERTIFICATES OF APPROVAL

A. Upon completion of the work, and as a condition to receiving payment at Substantial Completion, furnish to the Architect the following signed certificates and include the copies of these certificates in the Operation and Maintenance manuals:

1. Certificate from the Electrical Contractor stating that all electrical systems have been installed, tested and inspected in compliance with the Contract Documents, applicable codes and referenced standards. Where the subcontractors perform a portion of the work of this Section, include the certificates from them.
2. Certification from the manufacturers authorized representatives confirming that respective equipment has been installed and tested in accordance with the manufacturer's requirements, and equipment is in satisfactory operating condition. This certification shall be provided for the equipment where services of the manufacturer's representative are required by the specification.
3. Certification of inspection from the appropriate inspectional authorities stating that all portions of the work have been inspected and are installed in conformance with the applicable codes and standards. Provide written evidence of all exceptions or variances given by any Inspector.

END OF SECTION 260500

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.02 SUMMARY

A. This Section includes furnishing, installation and termination of the conductors required for power feeders, branch circuits, control wiring, fire alarm system, and other auxiliary systems shown on the drawings and/or included in the Specification, rated 600 volts and below. Installation includes placement, splicing, terminating conductors (including spare conductors), identification, testing, and verification of each circuit, cable, and conductor. Termination includes attaching each conductor in its designated location using the specified materials, and insulating the entire connection where specified or required by the application.

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Low tension control wiring.

1.03 SUBMITTALS

A. Product Data: Technical specification and literature for each type of product provided on the project.

B. Field quality control test reports.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in referenced Electrical Code, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with CMR 527, Massachusetts Electrical Code.

C. Comply with Underwriter's Laboratories (UL) standards:

1. UL 4: Armored Cable.
2. UL 62: Flexible Cord and Fixture Wire.
3. UL 83: Thermoplastic-Insulated Wires and Cables.
4. UL 486A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.
5. UL1569: Metal -Clad Cables.

D. Comply with NEMA WC-5: Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

1.05 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Feeder and branch circuit conductors:

1. Cablex, Inc.
2. American Insulated Wire Corp.
3. Pirelli Cable Corp.
4. General Cable Corporation.
5. Or equal.

B. MC Cable:

1. AFC.
2. Alliance Cable.
3. Alcatel.
4. Cablec Corporation.
5. Or equal.

C. Low Tension Cable:

1. Belden.
2. Cablex, Inc.
3. West Penn Wire Corp.
4. Or equal.

D. Lugs and Wire Connectors:

1. Buchanan
2. Ideal
3. Burndy
4. Thomas and Betts.
5. O-Z/Gedney.
6. 3M Electrical Products Division.
7. Or equal.

2.02 CONDUCTORS AND CABLES

A. Conductors up to 90Amperes: Copper wire, soft drawn, annealed, 98% conductivity, rated at 600 volts, and complying with reference Electrical Code. Minimum size # 12 AWG for the power circuits.

B. Conductors 100Amperes and higher shall be Aluminum, unless specifically noted otherwise on the drawings.

C. Conductor Insulation:

1. Conductors in raceways: Types THHN, THWN or XHHW, 90 degree C dry locations and 75 degree C wet locations. Ampacity of the conductors shall be based on a 75 deg. C. insulation level.
2. Conductors within lighting fixtures: Insulation for maximum operating temperature 150°C.

D. Metal Clad Cable (Type MC): Galvanized Steel armor, 600 volt copper conductors with THWN-THHN insulation and full size insulated green jacket grounding conductor. Aluminum armor will be rejected.

E. Low Tension Wiring:

1. Fire Alarm, Class 1 and Class 2 Control System Wiring: Solid copper wire, single conductors, rated 600 volts.
2. Conductor Size: Circuits at 120 volt AC: Minimum #14 AWG conductors, types THHN or THWN.
3. Circuits at 24 volt AC or DC: Minimum size required by the system manufacturer.

2.03 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

B. For copper wire No 14 through No. 8 AWG, solid or stranded, furnish screw-on pressure type connectors incorporating zinc-coated spring and insulating vinyl jacket with skirt.

C. For copper wire No. 6 AWG and larger, furnish bolt-on mechanical lugs with hex socket screws.

2.04 ACCESSORIES

A. Cable Ties: Furnish one of the following, or equal:

1. Thomas & Betts "Ty-Raps"
2. Holub Industries, Inc., "Quick-Wrap"
3. Burndy "Unirap"

B. Electrical Tape: Vinyl plastic, weatherproof electrical tape; 3M "Scotchbrand No. 88" or equal by Permacel or Plymouth Company.

2.05 COLOR CODING

A. Feeders and branch circuits:

1. Use following color coding:

Phase	208/120 Volts	480/277 Volts
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

2. Conductors #8 AWG or smaller: Continuous color coding.
3. Conductors # 6 AWG and larger: Provide continuous color coding or mark with colored tape at connections.

B. Low Tension Conductors: Color code required by each system manufacturer.

2.06 ELECTRIC HEAT TRACING

A. Electric Heat Cables: "Self-Regulating Rapid-Trace" as manufactured by Chromalox, or "XL-Trace" by Raychem, suitable for 120V or 208V line power without the use of transformers.

B. Heat tracing system shall provide power level at least 8 watts/linear foot for 8 inch pipes, and 5 watts/linear foot for 6 inch pipe and smaller. Heat trace system output is based on 2 in. fiberglass insulation thickness over metal pipe that shall be verified.

C. Heat tracing system for 140 degree. F temperature maintenance of the metal piping shall provide power level at least 8 watts/linear foot for 4 inch pipes and smaller. Heat trace output is based on 2 in. fiberglass insulation thickness over metal pipe that shall be verified.

D. Thermostatic Control: The system shall be controlled by an ambient sensing thermostat through an appropriate contactor. The system shall also have the ability to be controlled and monitored by the building automation system. The BMS system shall monitor the temperature sensor for alarms.

E. The system shall be protected by a circuit breaker with a 30 mA ground fault protection.

F. Accessories: Furnish all appurtenances necessary for complete installation and normal operation of the cables, including but not limited to:

1. Thermostats: Bulb-sensing type watertight outdoor thermostats, NEMA 4X enclosure, Raychem "Model AMC-1A" or equal by Chromalox, with fixed set point of 40°F.
2. Contactors: Raychem E304, NEMA 4X enclosure, three pole, 120 volt coil, for operation with heat tracing thermostat and circuits.
3. Power kit, splice kit, and seal kit.
4. Heat transfer foil: Chromalox "Type HTF" or Raychem polyolefin dielectric jacket.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders and Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW, single conductors in raceway.

B. Feeders Exposed or Concealed in Ceilings, Walls, and Partitions: Type THHN, THWN or XHHW in dry locations, and Type THWN or XHHW in wet locations**,** single conductors in raceway.

C. Feeders below Slabs-on-Grade and Underground: Type THWN or XHHW, single conductors in raceway.

D. Emergency (Life Safety) Feeders: Mineral-insulated, metal-sheathed cable, Type MI when they are not installed in the 2-hour fire-rated shafts.

E. Branch Circuits Exposed: Type THHN or THWN in dry locations, and Type THWN in wet locations**,** single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: In dry locations -Type THHN, THWN, single conductors in raceway or Metal-clad cable, Type MC.

G. Branch Circuits below Slabs-on-Grade and Underground: Type THWN or XHHW, single conductors in raceway.

H. Fire alarm wiring: In the conduits or low energy type cabling approved for fire-protective signaling circuits where is allowed by the Code.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Install all power and 120 volt control wire and cable in approved raceways and as approved by Authorities Having Jurisdiction. When low tension wiring is run exposed, install it in conduit. Plenum rated low tension cable may be used for installation above suspended ceilings where it is allowed by the Code and is allowed in the specification for the specific system.

B. Wire Size:

1. Install minimum No. 12 AWG for power and lighting circuits.
2. Install minimum No. 10 AWG for 120 volt 20 ampere branch circuits of 75 feet to 150 feet length, and minimum No. 8 AWG for the circuits of 150 feet to 250 feet unless otherwise shown on the drawings or required by the equipment shop drawings.
3. Install minimum No. 10 AWG for 277 volt 20 ampere branch circuits of more than 150 feet unless otherwise shown on the drawings.

C. Metal clad cable type MC may be used for branch circuit wiring above suspended ceilings and for device wiring in the metal stud partitions. MC cable shall not be used for a termination at the panels (homeruns) and where they run exposed.

D. Bundle conductors #10 and smaller in branch circuit panelboards, signal cabinets, signal control boards in switchboards and motor control centers.

E. Homerun Circuits:

1. Follow homerun circuit numbers shown on the drawings to connect circuits to the panelboards. Where homerun circuit numbers are not shown on the drawings, divide similar types of connected loads among phase busses so that currents in each phase are within 10% of each other during normal usage.
2. Wire multi-wire branch circuit homerun with two or three single phase and one common neutral conductor to a panel in a such manner that each phase circuit is fed from the adjacent circuit breakers. Do not combine circuits so that any homerun has more than three circuits (total of five wires) installed in one conduit, unless the circuit conductors are de-rated in strict accordance with the referenced Electrical Code.
3. Branch circuit wiring in the classrooms, laboratories and offices shall be provided with a dedicated neutral conductor for each phase conductor.

F. Properly group feeders, branch circuit and auxiliary system wiring passing through pull boxes and/or being made up in panelboards; neatly bind each group of wires together with plastic cable ties, and trim loose ends of the ties.

G. Peel branch circuits and auxiliary system wiring out of the wiring gutters at the terminal cabinet and panels at 90 degrees to circuit breakers and terminal lugs before making connections.

H. Color code conductors No. 6 AWG and larger by applying colored plastic tape at ends and where connections and splices are made. Wrap tape around the conductor three complete turns.

I. Splices and Terminations:

1. Make splices and joints by means of UL-listed, solderless connectors rated 600 volt, of sizes and types required by manufacturer's recommendations, with temperature ratings equal to that of wire.
2. Attach copper wire to panelboards, switchboards, disconnect switches and other electrical equipment by means of bolt-on lugs with hex screws. Properly size lugs; do not cut strands from a conductor in order to fit conductor into a lug.
3. Connectors for cables 250 MCM and larger shall have two clamping elements and terminals for bus connections shall have two bolt holes.

J. Identification: Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems." Label feeder and branch circuits in pull and junction boxes, handholes and at cable terminations in the panelboards, motor control centers, and switchboards. Use non-ferrous tags or labels stamped or printed to correspond with markings on the drawings or marked so that feeder or cable may be identified readily. If suspended tags are provided, attach with nylon line or cable lacing.

K. Connect branch circuits to the breakers in multi-phase panelboards required to balance loads.

L. Low Tension Cables: Provide separation from power wiring and lighting fixtures as follows:

1. Lighting fixtures - at least 6 inches.
2. Power branch circuit wiring with MC type cable - at least 12 inches.
3. Power branch circuit wiring in metal conduit - at least 6 inches.

M. When low-tension cables are not in conduit or trays, support cables from the deck and/or beams, spacing supports no farther apart than 6'-0" on center. Provide hangers, clips or other approved method of grouping the cables and keeping them away from other systems. Take care to ensure that ties, clips and other support devices do not compress the cable or damage cable insulation; use J-hooks whenever possible.

N. Cable Supports:

1. Provide cable supports for vertical feeders required by the referenced Electrical Code.
2. Support vertical feeders at each floor level.
3. Support and secure metal-clad cable Type MC at intervals not exceeding 6 feet and within 12 inches from every outlet box, junction box or cabinet.
4. Support metal clad cable Type MC with cable supports equal to Caddy WMX-6, MX-3, and clamps equal to Caddy 449. Where cables are supported by the structure and only need securing in place, then cable ties will be acceptable.

O. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

P. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

Q. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

R. For wiring in high temperature areas or high temperature equipment (i.e. boiler rooms, water heaters/boosters), furnish conductors for 90°C dry and wet rating.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.05 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.06 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections: After installing conductors and cables and before electrical circuitry has been energized, perform insulation-resistance test on each power conductor with respect to ground and adjacent conductors. Applied potential to be 1,000 volts dc for one minute. Perform continuity test to insure correct cable connection. Minimum insulation-resistance values shall be not less than 50-megohms.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.02 SUMMARY

A. This Section includes methods and materials for furnishing and installation of the solid grounding system for protection of life, equipment and circuits, including all bus bars, cable, ground rods, clamps, connectors, bolts plus the following special applications:

1. Common ground bonding with lightning protection system.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Informational Submittals: Plans showing as-built locations of grounding features, including the following:

1. Grounding conductors and accessories.

C. Field quality-control test reports.

D. Operation and Maintenance Manuals:

1. Instructions for periodic testing and inspection of grounding features.
   a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
   b. Include recommended testing intervals.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the referenced Electrical Code, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with IEEE 142, Recommended Practice for Grounding of Industrial and Commercial Power Systems.

D. Comply with CMR 527, Massachusetts Electrical Code.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the following:

1. Erico Products, Inc.
2. O-Z/Gedney Co.
3. Thomas & Betts Corp.
4. Ideal Industries, Inc.
5. Or Equal.

2.02 CONDUCTORS

A. Insulated Conductors: Soft drawn, Class B stranded copper with green polyvinyl chloride insulation jacket, insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors: Soft drawn, Class AA stranded copper per ASTM B8, standard 3/0 AWG unless indicated otherwise, for installation in soil or embedded in concrete

C. Grounding Bus: Rectangular bars of soft copper, cross not less than 1/4 inch thick by 2 inch wide, ASTM B 187, unless otherwise indicated; with the insulators.

2.03 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Hardware: Clamps, connectors, bolts, washers, nuts, and other hardware used with the grounding system shall be high-strength, high conductivity copper or copper alloy, bolted pressure-type, with at least two bolts.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

3.01 APPLICATIONS

A. System shall comply with Article 250 of the referenced electrical code, modified as shown on the drawings and as specified.

B. Equipment grounding system shall be installed so the metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in proximity to electrical circuits operate continuously at ground potential and provide low impedance path for possible ground fault currents.

3.02 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items by weld connecting them with at least No.2 AWG conductor to grounding grid. Bury ground ring not less than 12 inches from the foundation.

3.03 EQUIPMENT GROUNDING

A. Provide separate green insulated equipment grounding conductor for each single or three-phase feeder and each branch circuit. Install grounding conductor in common conduit with related phase or neutral conductors, or both. Parallel feeders installed in more than one raceway shall have individual full size green insulated equipment ground conductors in each.

B. Install insulated equipment grounding conductors with the following items:

1. Feeders and branch circuits.
2. Receptacle circuits. From ground terminals of the receptacles to a machine screw in an outlet box, and to panelboard grounding bus.
3. Armored and metal-clad cable runs.
4. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from a grounding bus in the power panels.

C. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

D. Conduit Grounding: All grounding bushings within all enclosures, including equipment enclosures, shall be bonded together and connected internally to the enclosure grounding lug or grounding bus with a bare copper conductor. Grounding bushings shall be grounded with conductors sizes in accordance with the referenced Electrical Code, but not smaller than 12 AWG.

E. Nonmetallic Raceways: Install an insulated equipment grounding conductor in non-metallic raceways.

3.04 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service

grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops at least 6 inches below finished floor or final grade, unless otherwise indicated. Interconnect ground rods with grounding electrode conductor below grade.

D. Dry type transformer: Install an insulated grounding conductor from a transformer neutral to the building steel by means of copper wire, as scheduled on the drawings.

3.05 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with the requirements.
2. Measure ground resistance level at the service disconnect grounding terminal.
3. Make tests at ground rods before any conductors are connected
   a. Measure ground resistance in dry weather, and without soil being moistened by any means other than natural drainage.
   b. Perform tests by fall-of-potential method according to IEEE 81.

END OF SECTION 26 05 26

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.02 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Vibration and seismic controls for electrical equipment and systems.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Shop drawings, certified by a professional engineer, shall be provided for the seismic restraints. The shop drawings shall include details for restraints' fabrication and installation including anchorage and attachments to the structure.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.04 SUBMITTALS

A. Product Data: For each type of hanger or support furnished under this Section. Indicate materials, gauges, and methods of attachment.
1. Steel slotted support systems.
2. Hanger rods.
3. Pipe clamps.
4. Bracket supports.
5. Concrete anchors.
6. Vibration mounts.

B. Shop Drawings: Signed and sealed by a qualified professional engineer**.** Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.

PART 2 - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Hot-dip galvanized, comply with MFMA-4, factory-fabricated components for field assembly. Fittings and clips for construction of exterior supports.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line.
   c. GS Metals Corp.
   d. Thomas & Betts Corporation.
   e. Unistrut.
   f. Or equal.
2. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Galvanized steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces to suit individual conductors or cables supported. Body shall be malleable iron.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Hilti Inc.
      2) ITW Ramset/Red Head.
      3) MKT Fastening.
      4) Simpson Strong-Tie Co.
      5) Or equal.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used. Stainless steel type in corrosive environment.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Empire Tool and Manufacturing Co.
      2) Hilti Inc.
      3) ITW Ramset/Red Head.
      4) MKT Fastening, LLC.
      5) Or equal.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Galvanized threaded steel, at least 3/8 inch diameter or larger if required to support loads.

2.02 SEISMIC REQUIREMENTS

A. Seismic Performance: Furnish and install electrical equipment to resist seismic forces in accordance with Massachusetts Building Code 780 CMR Article 1613.

B. Seismic restraint shall be provided for the electrical equipment such as switchboards, panels, motor control centers, transformers, generators, bus ducts, conduits, cable trays and lighting fixtures.

C. Manufacturer of the seismic control products shall have the following responsibilities.

1. Determine seismic restraint sizes, type and locations.
2. Provide equipment seismic restraints.
3. Provide installation instructions, drawings and field supervision to insure proper installation and performance.
4. Certify seismic restraint design and installation upon completion of work.

C. Seismic control products manufacturers:

1. Ace Mountings Co., Inc.
2. Isolation Technology, Inc.
3. Mason Industries.
4. Vibration Eliminator Co., Inc.
5. Vibration Mountings & Controls, Inc.
6. Or equal.

2.03 VIBRATION ISOLATORS

A. Vibration Isolation Type DNP (Double Neoprene Pad)

1. Neoprene pad isolators shall be formed by two layers of 1/4 inch to 5/16 inch thick ribbed or waffled neoprene, separated by a stainless steel or aluminum plate. These layers shall be permanently adhered together. The pads shall be sized so that they will be loaded within the manufacturer's recommended range.
2. Manufacturers: Vibration Mountings and Controls, Inc. - Series Shear Flex, Mason Industries- type WSW, Amber/Booth – type NR, or equal.

B. Vibration Isolation Type HN (Hanger Neoprene)

1. Vibration isolation hangers shall consist of neoprene-in-shear or glass fiber element contained in steel housing. Neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing. The diameter of the hole in the housing shall be sufficient to permit the hanger rod to swing through a 30 degree arc before contacting the hanger housing.
2. Manufacturers: Vibration Mountings and Controls, Inc.- type RHD or RFD, Mason Industries- type HD, Amber/Booth – type BRD-A, or equal.

PART 3 - EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC by referenced Electrical Code.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so a capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

D. Conduit Supports:

1. Conduits in single runs or groups of two: Support by means of one-hole cast metal clamps and clamp backs.
2. Banks of three more conduits: Construct racks from steel support channels, channel fittings, and thermoplastic fasteners with associated conduit or tubing clips.
3. For support of conduit exposed to exterior, use hot-dip galvanized channels and fittings and hot-dip galvanized, stainless steel, or other non-corroding fasteners.

E. Cabinet and Box Supports: Field fabricate mounting racks from steel support channels and fittings. Fabricate racks for use outdoors from hot-dip galvanized support channels, fittings and fastening hardware.

F. Supports for Conduit and Equipment in Corrosive Areas: In areas designated on the drawings as "corrosive," field-fabricate racks from fiberglass support channels and channel fittings, and thermoplastic fastening hardware.

1. Provide free-standing or wall-mounted equipment racks as indicated on the drawings.
2. Secure free-standing racks to the floor or slab using stainless steel expansion anchors and hardware.
3. Rigidly mount wall-mounted equipment and cabinets; fasten to concrete and masonry with stainless steel expansion anchors and fastening hardware.

3.02 SUPPORT INSTALLATION

A. Attachment to Roof Joists: Attach hangers to the top chord or bottom chord panel point or panel point provided by applying a vertical web member. The maximum load shall be as allowed by the structural drawings and specification.

B. Attachment to Beams: Attach hangers to beams with clamp attachments which engage both edges of the beam flange. Locate the hanger directly below the web of the beam; limit hanger load to 1,000 pounds in area above mechanical room and to 250 pounds in remaining areas, unless otherwise approved by the Architect.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or spring-tension clamps.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
8. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 CONCRETE BASES

A. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.04 PAINTING

A. Touchup: Comply with requirements in Division 09 for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.02 SUMMARY

A. Furnishing and field installation of the complete raceway system in accordance with the specifications and as indicated on the drawings. Furnish raceways in quantities sufficient for a complete installation. The raceway system includes raceways, fittings, boxes, cabinets, and all materials and devices required to install, support, secure a complete system for electrical wiring.

1.03 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.

C. Coordination: Coordinate the work specified in this section with other work of the Contract. Coordinate the placement of raceways with Structural drawings, HVAC and Plumbing ductwork, piping and equipment prior to installation. If required for proper coordination, prepare Coordination Drawings with conduit routing plans, drawn to scale.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in referenced Electrical Code, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with CMR 527, Massachusetts Electrical Code.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Electri-Flex Co.

4. Wheatland.

B. Rigid Steel Conduit (RSC), couplings and elbows: ANSI C80.1 and UL 6; hot-dip galvanized, rigid mild steel, zinc-coated on interior and exterior surfaces.

C. Intermediate Metal Conduit (IMC): Hot-dip galvanized mild steel conforming to ANSI C80.6, UL 1242, and Fed. Spec. WW-C-581.

D. Electrical Metallic Tubing (EMT): Zinc-coated steel conforming to ANSI C80.3 and UL 797. Fabricate tubing, elbows and bends from steel, coated on interior and exterior surfaces with a continuous zinc coating.

E. Flexible Conduit: Galvanized, interlocking steel construction (Greenfield), meeting the requirement of UL 1.

F. Liquid-Tight Flexible Conduit: Plastic or plenum-rated jacket material, flexible, galvanized steel, Sealtite Type EF for general service areas or Type HC for high temperature locations.

2.02 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. R&G Sloan.
3. Electri-Flex Co.
4. Carlon Electrical Products.
5. RACO; a Hubbell Company.
6. Thomas & Betts Corporation.

B. Non-Metallic Conduit (NMC): Rigid polyvinyl chloride (PVC), Schedule 40, rated for use with 90 degree conductors, UL rated or approved equal, conforming to industry standards and specifications NEMA TC-2, NEMA TC-3, Fed. Spec. W-C-1094, and UL 651.

1. Furnish conduit, fittings, and cement produced by the same manufacturer, who must have had at least 3 years of experience in manufacturing the products.
2. Joints: Join sections of PVC pipe using solvent recommended by the pipe manufacturer and acceptable to the Owner. Use solvent and make joints in accordance with the recommendations of the pipe manufacturer.

C. Fittings for NMC: NEMA TC 3; match to conduit or tubing type and material.

2.03 FITTINGS

A. Metal conduit fittings: UL 514, galvanized iron or galvanized steel threaded fittings with steel conduit. Do not use compression fittings with RSC and IMC.

B. Fittings for electrical metallic tubing: Galvanized steel, set screw type.

C. Liquid-tight flexible conduit fittings: Galvanized steel, bearing the UL label.

D. Flexible metal conduit fittings: Galvanized malleable iron or steel.

E. Expansion fittings: Weatherproof, galvanized steel, with bonding jumpers; Crouse-Hinds or acceptable equal.

F. Special Fittings: Furnish conduit sealing, explosion proof, dust proof, and other types of special fittings required by the drawings and these specifications, consistent with the area and equipment with which they are associated, and in accordance with the following requirements:

1. Fittings installed outdoors: Heavy cast construction; sealed and gasketed.
2. Fittings installed indoors in damp locations: Sealed, gasketed.

G. Combination Fittings: For connection rigid steel conduit to electrical metallic tubing, furnish fittings which have a threaded throat to receive the rigid steel conduit and a compression type throat to receive the electrical metallic tubing.

H. Bushings: Galvanized bushings for the termination of all conduit not terminated in hubs and couplings. Provide grounding type insulated bushings with insulating inserts in metal housings for conduit 1-1/4 inches and larger.

I. Locknuts: Interior and exterior locknut for all conduit terminations not provided with threaded hubs or connectors. Provide locknuts which will securely bond the conduit to the box when tightened, and which will not be loosened by vibration.

J. Conduit Unions: Watertight conduit unions, Crouse-Hinds "Type UNF" or approved equal.

2.04 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D.
4. Or equal.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 for indoor and 3R for outdoor installation, unless otherwise indicated. Steel enclosed wiring trough designed to house electrical wiring. Fabricate from steel gauges as specified below, in sizes shown on drawings.

1. Wireway sizes less than 8 inch square: 16 gauge steel
2. Wireway sizes 8 inch square or larger: 14 gauge steel

C. Elbows: Use 45 degree elbow bends with inside radius of elbow at least 12 inches. Make up 90 degree bends from two 45-degree elbows; do not use 90 degree elbows.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways required for complete system.

E. Wireway Covers: Furnish straight wireway lengths with hinged cover.

F. Finish: Manufacturer's standard enamel finish.

2.05 SURFACE RACEWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Thomas & Betts Corporation.
2. Wiremold Company.
3. Hubbell.
4. Or equal.

B. Surface Metal Raceway: Two-piece construction with snap-on cover; fabricated from cold-rolled steel, 0.040 inch minimum thickness for base and cover sections. Finish with ANSI 61 gray epoxy paint. Equal to Wiremold "G 3000."

C. Two-Compartment Surface Metal Raceway: Two-piece construction with snap-on cover, capable of being divided into two separate wiring compartments to facilitate installation of power and low tension wiring. Fabricate from cold-rolled steel and finish with ANSI 61 gray epoxy paint. Equal to Wiremold "G 4000."

D. Fittings and Accessories: Furnish fittings for end feeds, blank ends to close ends, clips, side and end transition connectors, elbows, couplings, and all other fittings and accessories required for a complete installation.

E. Fittings for Wiring Devices: Provide covers, housing and mounting brackets to facilitate installation of the wiring devices (receptacles, switches, circuit breakers, and similar devices) in the surface metal raceway. Type of devices, locations and spacing are shown on the drawings.

2.06 PULL AND JUNCTION BOXES

A. Manufacturer: Furnish products manufactured by one of the following:

1. Appleton Electric Company
2. Commercial Sheet Metal Company.
3. Lee Products Company.
4. Harry Richmond Company.
5. RACO.
6. Or equal.

B. Fabrication, Standard Boxes: Construct pull and junction boxes in accordance with UL 50 and ANSI/NEMA OS1. Fabricate from 16 gauge or heavier sheet steel; with removeable, full access covers, attached with corrosion-resistant machine screws. Finish boxes with one coat of grey enamel. Boxes with covers which have pre-punched knockouts will not be acceptable.

C. Weatherproof Boxes: For installation in wet locations, furnish cast metal, NEMA FBI boxes with gasketed covers.

D. Corrosion Resistant Boxes: For installation in areas exposed to corrosive atmosphere, furnish PVC Schedule 40 boxes.

E. Junction Boxes in Metal Stud Partitions: Galvanized pressed steel boxes with blank cover plates. Minimum size 4-11/16 inches square by 1-1/2 inches deep.

F. Junction Boxes Installed Above Suspended Ceiling: Galvanized pressed steel poxes with blank cover plates. Minimum size 4-11/16 inches square by 2-1/8 inch deep.

G. Dimensions: Not less than that required by the referenced Electrical Code, Article 314.

2.07 OUTLET AND SWITCH BOXES

A. Manufacturer: Furnish products manufactured by one of the following:

1. Appleton Electric Company
2. Crouse-Hinds Company
3. Hubbell
4. Raco
5. Steel City Electric Company
6. Thomas & Betts.
7. Or equal

B. Furnish outlet boxes, switch boxes, and associated fittings which conform to UL 514.

C. Outlet Boxes in Dry Locations: ANSI/NEMA OS1, fabricated from galvanized steel sheet; minimum depth 2-1/8 inches deep; equipped with plaster rings or gasketed covers as necessary.

D. Outlet and Switch Boxes for Wet Locations: NEMA FBI, ferrous alloy or aluminum, Type FD, with gasketed cover.

E. Boxes which support lighting and equipment: Provide boxes rated for weight of equipment where supported; include 1/2 inch male fixture studs where required.

F. Floor Outlet Boxes: Pressed steel, unless indicated otherwise. Furnish cast iron boxes for slab on grade outlets. Furnish with compatible accessories, including gaskets, flush floor plates, device mounting plates and covers.

G. Concrete Ceiling Boxes: Concrete type.

H. Telephone Outlets: Provide 4 inch square box with a single gang device plate. Plate material shall match material and finish of the switch and receptacle plates, unless otherwise indicated.

2.08 CABINETS AND ENCLOSURES

A. Manufacturers: Furnish products manufactured by one of the following:

1. Hoffman.
2. Lee Products.
3. Steel City.
4. Or equal.

B. Hinged Cover Enclosures: NEMA 250 steel enclosure with cover with continuous hinge and flush latch. Finish inside and out with manufacturer's standard enamel.

C. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer’s standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.09 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated “wall pipe,” equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

	Type of conduit	Applications/Locations:
A.	Rigid steel conduit:	Exterior exposed conduit runs. Conduit penetrations of the floor slab or foundation wall. Where a conduit penetrates a foundation wall, install rigid steel conduit within 5 feet from the foundation wall.
B.	Rigid or intermediate steel conduit:	Concealed outdoor conduit runs. Interior exposed locations below 8 feet above finish floor where subject to mechanical damage. Interior wet locations.
C.	Non-metallic conduit:	Conduit installed underground (minimum size 3/4 inch). Where a conduit penetrates a foundation wall, make transition to a rigid steel conduit at a distance of 5 feet from the wall. Conduit embedded in a concrete slab (maximum size1inch, multiple parallel runs are not allowed) when specifically approved by the Architect.
D	EMT:	Feeders and branch circuit runs installed above ceiling, in wall spaces, and in exposed locations 8 feet above finish floor. Do not use EMT for exterior runs, runs buried in concrete, in wet locations, or where conduit may be subject to mechanical abuse.
E.	Flexible Conduit:	Connections to electrical equipment and other equipment furnished under HVAC and Plumbing Sections that are subject to movement, vibration, or misalignment, where available space dictates, and where noise transmission must be eliminated or reduced. Limit length of flexible conduit in these applications to no more than 24 inches. Flexible conduit may be used for connecting to light fixtures. Maximum length of flexible conduit allowed shall be 6'-0" from junction box to light fixture. Lighting branch circuit home runs to panelboard shall be in conduit or EMT.
F.	Liquid-Tight Flexible Conduit:	Applications specified for flexible conduit which are in addition: 1. Exterior locations. 2. Moisture or humidity-laden atmospheres. 3. Corrosive atmospheres. 4. Locations where washdown operations are possible. 5. Locations where seepage or dripping of oil, grease or water is possible.

3.02 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Install all wiring, in minimum 1/2 inch size, rigid metal conduit, intermediate metal conduit or EMT, subject to the restrictions of the referenced Electrical Code, unless otherwise noted on the drawings or in the conduit schedule.

C. Type of Conduit: Comply with the raceway application for each type of conduit.

D. Run conduit concealed in finished areas above suspended ceilings, in wall spaces. Exposed conduit runs in finished areas require Architect's approval. Properly group conduit runs. Install conduit parallel to walls and ceilings, and support with proper hangers and clamps. Check door swings before installing back boxes for switches and receptacles.

E. Where conduit passes through a building expansion joint, use weatherproof, telescopic type expansion fittings which permit at least 4 inches of movement.

F. Form bends in conduit by means of a conduit bending machine or by an approved hickey. To fasten conduit to outlet boxes, cabinets, use locknuts and insulated throat bushings of compatible material.

G. Cut conduit ends square, thread conduit, and ream to remove burrs and sharp edges. Field threads shall be of the same type and have the same effective length as factory cut threads. Turns, wherever required in exposed conduit runs, shall be made by the use of factory-made bends, or field-made bends as approved. In the event of a multiplicity of conduits making the same turn, a steel junction box with a removable steel cover may be used. Offsets and bends for changes in elevation of exposed conduit runs shall be made at walls or beams and not in open spaces between walls or beams. Rout conduits required to avoid interfere with the operation or maintenance of equipment.

H. Group related conduits. Refer to Section “Hangers and Supports” for conduit racks, supports and fittings. When groups are supported on conduit rack, provide enough excess capacity to accommodate 25 percent additional conduit runs.

I. Plug or cap conduit ends as soon as conduit is installed, to prevent entrance of moisture or other debris during construction. Do not pull wire into any conduit until the conduit system is complete.

J. Drawings, in relation to the routing of conduits, are diagrammatic. Except where additional conduits may be required to avoid derating of branch circuits, elsewhere within this Section, the number and size of conduits and wire shall be furnished and installed as indicated by the drawings. Coordinate routing of conduits in the field with the building structure. Run conduit in straight lines parallel and perpendicular to walls, beams, and columns and with right angle bends and threaded conduit fittings. Maintain 12 inches clearance between conduit and surface with temperatures exceeding 104 degrees F.

K. Conduits passing through floors, walls and beams shall be of such size, number, and in such locations so as not to impair the strength of the construction.

L. Rout raceways in ceiling spaces in an orderly and organized manner, and to eliminate or minimize the number of junction boxes required. Support and secure conduits by means of rods, clamps and other conduit support devices approved by the Architect. Do not use wire to support conduits.

M. Where rigid metal conduit is threaded in the field, use a standard conduit cutting die providing 3/4 inch taper per foot.

N. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to outlets. Secure conduit to cabinet, junction box, pull box or outlet box with locknut outside and bushing inside, or with liquid-tight, threaded, self-locking, cold-weld wedge adapter. Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into tapped connections. Before installing conductions, protect vertical conduit runs that terminate in bottoms of wall boxes or cabinets from entrance of foreign material.

O. Size rigid steel conduit, EMT and flexible metallic conduit required by the referenced Electrical Code, except as otherwise specified or shown on the drawings. Check raceway sizes to determine that equipment grounding conductor fits in same raceway with phase and neutral conductors to meet Massachusetts Electrical Code percentage of fill requirements.

P. Where conduit is secured rigidly on opposite sides of building expansion joints, and where runs of exposed conduit are long and subject to stress, provide expansion fittings capable of safely deflecting and expanding to twice the distance of structural movement. Provide separate external copper bonding jumper secured with grounding straps on each end of fitting.

Q. Install a pull or junction box every 100 feet of straight conduit run, and wherever there is an equivalent of four 90 degree elbows or a total of 360 degree bend. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

R. Install sealing fittings at following points, and elsewhere as shown:

1. Where conduits enter or leave hazardous areas equipped with explosion proof lighting fixtures, switches, receptacles, and other electrical devices.
2. Where conduits pass from warm to cold locations.

S Pull cords: In each empty raceway, provide nylon fishing line having tensile strength not less than 200 lbs, or provide No. 14 AWG steel wire. Label each end of each line or wire with a securely attached tag which indicates the location of the other end.

T. Liquid-tight type flexible conduits installed in the air-handling plenum space shall be with a plenum- rated outer jacket.

U. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

V. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

3.03 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both surfaces of walls.

E. Extend sleeves installed in floors 2 inches above finished floor level.

F. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

G. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

3.04 BOXES INSTALLATION

A. Electrical drawings and specification indicate general locations and mounting heights of wall outlets, switches, and similar devices; architectural details, wall elevations, and floor plans take precedence over information on electrical drawings. Verify all locations and mounting heights with Architect before roughing in.

B. Provide outlet boxes for all wiring devices as shown on the drawings. Use bar hanger type outlet boxes in steel stud partitions. Provide gang box partitions in the multi-gang outlet box installation when the voltage between adjacent lighting switches exceeds 300 volts.

C. Stagger outlet boxes on opposite sides of partitions a minimum of 12 inches on center; do not install back-to-back.

D. When setting boxes into surfaces which are to be finished, offset boxes to allow for proper adjustment to finished surfaces.

E. Mount boxes rigidly and screw-fasten covers. Plug unused open knockouts with suitable blanking devices. Provide blank covers for boxes that do not have equipment mounted on them.

F. Install pull boxes and junction boxes concealed (above accessible ceilings or in unfinished areas), unless shown otherwise on the Drawings.

3.05 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.06 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.02 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.03 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.04 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2 with regard to type and size of lettering for raceway and cable labels.

B. Comply with NFPA 70.

C. Comply with ANSI Z535.4 for safety signs and labels.

D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.05 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, drawings, shop drawings, manufacturer's wiring diagrams. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 POWER RACEWAY

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type (Power, Lighting, Emergency, Control).

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high letters.

D. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

E. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway. Stop stripes at legends.

F. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

G. Write-On Tags: Polyester tag, with corrosion-resistant grommet and cable tie for attachment to conductor or cable. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.02 ARMORED AND METAL-CLAD CABLE

A. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.03 POWER AND CONTROL CABLE

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

D. Write-On Tags: Polyester tag, with corrosion-resistant grommet and cable tie for attachment to conductor or cable. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

E. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.04 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

E. Write-On Tags: Polyester tag, with corrosion-resistant grommet and cable tie for attachment to conductor or cable. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.05 WARNING LABELS AND SIGNS

A. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

B. Baked-Enamel Warning Signs:

Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. Nominal size, 7 by 10 inches.

C. Metal-Backed, Butyrate Warning Signs:

Weather-resistant signs, non-fading , preprinted, cellulose-acetate butyrate signs with galvanized-steel backing; and with colors, legend, and size required for application. Nominal size 10 by14 inches.

D. Safety signs shall warn of potential electrical hazard and shall include, but are not limited to, the following legends:

1. Multiple power source warning.
2. Workspace clearance warning.
3. Potential electric arc flash hazard.

2.06 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.07 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking. UL 94 Flame Rated.

2.08 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Verify identity of each item before installing identification products. Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and required by code.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

J. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

K. Renovation Projects: For alterations and additions to existing facilities, use existing identification system. Where systems have not been standardized, use the identifying and marking system specified in this standard.

L. Distribution Equipment: Identify major components of the distribution system (such as circuit breakers, switches, transformers, switchboards, panelboards, motor control centers) with nameplates. Nameplates on disconnect switches and control stations shall identify the equipment served.

3.02 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for service, feeder, and branch circuits more than 30A and 120V to ground: Identify with self-adhesive vinyl label applied at 10-foot maximum intervals.

B. Power-Circuit Conductor Identification, 600 V or Less: Identify conductors in the panels, pull and junction boxes, manholes, handholes.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors for ungrounded service, feeder and branch-circuit conductors as specified in Division 26 Section “Low-Voltage Power Conductors”.
   a. Factory applied continuous color coding for conductors No.8 AWG and smaller.
   b. Field-applied, color coding conductor tape: For conductors No.6 AWG and larger. Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made.
2. Lighting and Receptacle Outlet Boxes: Identify with the panel and circuit number.

C. Power-Circuit Conductor Identification, above 600 V: For conductors in the vaults, pull and junction boxes, manholes and handholes, use write-on tags.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Terminal Blocks: Attach numbered nameplates to terminal blocks which require identification numbers; use the designations shown on the wiring diagrams. Install nameplate at the top of vertically mounted terminal blocks and at the end of horizontally mounted terminal blocks. Indicate the individual terminal point designation shown on the wiring diagrams.
3. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

E. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in the finished spaces.

F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Apply warning, caution, and instruction signs where required by the referenced Electrical code, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install self-adhesive warning labels or baked-enamel warning signs with approved legend where instructions or explanations are needed for system or equipment operation. Install metal-backed, butyrate warning signs for outdoor items.

G. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer, load shedding and other emergency operations.

H. Safety sign for the switchboards and panelboards: Provide a sign to warn qualified persons of potential electric arc flash hazard.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to the disconnect switches and protection equipment, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
   a. Indoor Equipment: Self-adhesive, laminated acrylic or melamine label.
   b. Outdoor Equipment: Engraved, laminated acrylic.
   c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
2. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved laminated acrylic. Panelboard directories shall identify the load name and location (i.e. AHU-1, Room # , FCU-1, Room #).

END OF SECTION 26 05 53

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.02 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Non-fusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.03 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, weights, manufacturers' technical data on features, performance, electrical characteristics, ratings, diagrams, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Short-circuit current ratings (interrupting and withstand, as appropriate).

B. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.

C. Operation and Maintenance Data: In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the referenced Electrical Code, by a qualified testing agency, and marked for intended location and application.

1.05 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.06 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type.

PART 2 - PRODUCTS

2.01 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. General Electric.
3. Siemens Energy & Automation, Inc.
4. Square D.

B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.

2.02 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. General Electric.
3. Siemens Energy & Automation, Inc.
4. Square D.

B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors.
3. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.

2.03 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. General Electric.
3. Siemens Energy & Automation, Inc.
4. Square D.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

E. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

F. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact , where shown on the drawings.
4. Auxiliary Contacts: One SPDT switch, where shown on the drawings.

2.04 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen Wash-Down Areas: NEMA 250, Type 4X.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Non-corrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Disconnect switches for elevator machines shall have one normally open and one normally closed contact which change state when switch is placed in the OFF position for interlock with elevator battery lowering device.

C. Comply with mounting and anchoring requirements specified for vibration and seismic controls.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.03 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.04 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 262816

SECTION 263353

UNTERRUPTIBLE POWER SUPPLY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction", 2007 Edition, the Supplementary General Conditions and Division I, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work.

1.02 SUMMARY

A. This specification describes a continuous duty, three-phase, solid-state, static Uninterruptible Power System (UPS) hereafter referred to as the UPS. The UPS shall contain a full rated input rectifier / boost converter (hereafter referred to as Input Converter), output inverter, and 10 percent battery charging circuit. The system shall also contain a continuous duty bypass static switch, internal mechanical bypass, removable hot swap battery plant, and LCD interface display. All of the above system components are housed in a single enclosure. Maintenance bypass and extended battery is required to meet this specification shall be contained in matching enclosures with all interconnecting cabling included. All programming and miscellaneous components for a fully operational system as described in this specification shall be provided as part of the UPS.

1.03 STANDARDS

A. The UPS shall meet the requirements of the following standards:

1. IEEE 587-1980/ANSI C62.41 1980 Standards for Surge Withstand Ability.
2. FCC rules and regulations of Part 15, Subpart J, Class A.
3. UL listed under 1778, Standards for Uninterruptible Power Supply Equipment.
4. UL Canada (cUL).
5. NEMA PE 1 (National Electrical Manufacturers Association) - Uninterruptible Power Systems.
6. NEMA 250 (National Electrical Manufacturers Association) – Enclosures for Electrical Equipment (1000 Volts Maximum).
7. IEEE 519-1992 Standard Practices and Requirements for Harmonic Control in Electrical Power Systems
8. NFPA 70 – National Electrical Code.
9. ISO 9001.
10. ISO 14001
11. Occupational Safety & Health Administration (OSHA).

1.04 SUBMITTALS

A. Submittals shall contain the following documentation:

1. Installation Drawings: Indicate electrical characteristics and connection requirements. Provide cabinet dimensions; battery type, size, dimensions, and weight; detailed equipment outlines, weight, and dimensions; location of conduit entry and exit; single-line diagram, control, and external wiring requirements; heat rejection, full and part load efficiencies and air flow requirements.
2. Product Data: Provide catalog sheets and technical data sheets to indicate physical data and electrical performance, electrical characteristics, and connection requirements.

1.05 WARRANTY

A. UPS Module: The UPS shall be covered by a full parts and labor warranty from the manufacturer for a period of 12 months from date of substantial completion and acceptance by customer.

B. Battery: The battery manufacturer's warranty shall be passed through to the final customer and shall have a minimum period of one year. (Alternate #1)

1.06 MAINTENANCE, ACCESSIBILITY AND SELF DIAGNOSTICS

A. All UPS subassemblies, as well as the battery, shall be accessible from the front. UPS design shall provide maximum reliability and minimum MTTR (mean time to repair). To that end, the UPS shall be equipped with a self-test function to verify correct system operation. The self-test function shall identify the subassembly-requiring repair in the event of a fault. The electronic UPS control and monitoring assembly shall therefore be fully microprocessor based, thus doing away with all potentiometer settings. This shall allow:

1. Auto-compensation of component drift;
2. Self-adjustment of replaced subassemblies;
3. Extensive acquisition of information vital for computer-aided diagnostics (local or remote);
4. A socket for connection to a computer-aided diagnostics system.
5. The UPS shall be repairable by replacing standard subassemblies requiring no adjustments or settings. Communication with a remote maintenance system shall be possible.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION AND OPERATION

A. One UPS unit will be required for this project. Manufacturer: Mitsubishi 2033C Series UPS (battery cabinet is existing). This model has been disconnected however, they are still available. Contact Manufacturers Representative for availability.

B. UPS Design Requirements:

1. Output Power Continuous Rating: The continuous output power rating of the UPS shall be shall be at 16KW, 20KVA at a 0.8 lagging power factor.
2. Input Voltage: 208 VAC – 25 percent / +15 percent, 3 phase, 4 wire plus ground.
3. Output voltage: 208 VAC 3 phase, 4 wire plus ground.
4. Battery Autonomy: The UPS shall have battery strings such that it shall be capable of operating at full load for 8 minutes at 0.8 PF output at a temperature of 25°C on battery power.

C. AC Input Characteristics:

1. Input Frequency: 60 Hz (- 25 percent to + 15 percent)
2. Maximum Input Current at Low Line Voltage: 35 A with 125 percent continuous overload.
3. Input Power Factor: > .98 lagging for loads greater than 50 percent and > .95 for loads greater than 15 percent.
4. Harmonic Distortion of Input Current Wave Form: less than 5 percent at full load.
5. Power walk-in: Linear 0 to 100 percent over a 15-second period.
6. Magnetizing Inrush Current: Less than nominal input current for less than one cycle.

D. AC Output Characteristics:

1. Voltage Regulation: + 1.0 percent for balanced load; + 1.75 for 50 percent unbalanced load; + 2.5 percent for 100 percent unbalanced load
2. Frequency: 60 Hz +1 percent (or selectable up to 4 percent). 60 Hz + 0.1 percent when free running.
3. Voltage Distortion: Maximum 2 percent total (THD) and 1 percent any single harmonic on 100 percent linear loads.
4. Voltage Transient (Step Load) Response:

    a. + 3 percent for 50 percent step load change
    b. + 5 percent for 100 percent step load change
    c. + 1 percent for loss or return of AC input power or manual transfer at full load.

5. Voltage Recovery Time: Return to within 1 percent of nominal value within 50 milliseconds.
6. Phase Angle Displacement: 120° + 1° degrees for balanced load; 120° + .3° degrees for 100 percent unbalanced load
7. Non-Linear Load Capability: Output voltage total harmonic distortion shall be less than 3 percent when connected to a 100 percent non-linear load with a crest factor not to exceed 3.0.
8. Slew Rate: 1 Hz/second maximum (or selectable up to 2.0 Hz/sec).
9. Power Factor: 0.8 at the rated volt-amperes (VA)
10. Inverter Overload Capability:

    a. 120 percent of rated load for 1 minute
    b. 145 percent of rated load for 30 seconds

11. Bypass Overload Capability: > 800 percent for 500 milliseconds, 125 percent continuous.

    a. Overall AC to AC efficiency with fully charged battery 93.5 percent at full load and 92.5 percent at 50 percent load.

E. DC Bus:

1. Normal DC voltage 192VDC.
2. Maximum DC current at cutoff voltage will be 29 A.
3. End of discharge 152VDC

F. Modes of Operation:

1. The UPS module shall be designed to operate as a double conversion, on-line reverse transfer system in the following modes.

   a. Normal: The input converter and output inverter shall operate in an on-line manner to continuously regulate power to the critical load. The input and output converters shall be capable of full battery recharge while simultaneously providing regulated power to the load for all line and load conditions within the range of the UPS specifications.
   b. Battery: Upon failure of the AC input source, the critical load shall continue being supplied by the output inverter, which shall derive its power from the battery system. There shall be no interruption in power to the critical load during both transfers to battery operation and retransfers from battery to normal operation.
   c. Recharge: Upon restoration of the AC input source, the input converter and output inverter shall simultaneously recharge the battery and provide regulated power to the critical load.
   d. Static Bypass: The static bypass shall be used to provide transfer of critical load from the Inverter output to the bypass source. This transfer, along with its retransfer, shall take place with no power interruption to the critical load. In the event of an emergency, this transfer shall be an automatic function.
   e. Internal Mechanical Bypass: As a standard feature, the UPS shall be equipped with an internal, make before break, bypass switch. This switch shall mechanically bypass the UPS for times where maintenance is required.

G. Component Description:

1. Rectifier / Battery Charger

   a. The input power converters of the system shall constantly control the power imported from the mains input of the system, to provide the necessary UPS power for precise regulation of the DC bus voltage, battery charging, and Main Inverter regulated output power:

      a) Soft-Start Operation: As a standard feature, the UPS shall contain soft-start functionality, capable of limiting the input current from 0-100 percent of the nominal input over a default 15 second period, when returning to the AC utility source from battery operation. The change in current over the change in time shall take place in a linear manner throughout the entire operation. (di/dt= constant)
      b) Input Current Total Harmonic Distortion: The input current THDI shall be held to 5 percent or less at full system, while providing conditioned power to the critical load bus, and charging the batteries under steady-state operating conditions. This shall be true while supporting loads of both a linear or non-linear type. This shall be accomplished with no additional filters, magnetic devices, or other components.

c) The input converter shall control and limit the input current draw from utility to 150 percent of the UPS output. During conditions where input current limit is active, the UPS shall be able to support 100 percent load, charge batteries at 10 percent of the UPS output rating, and provide voltage regulation with mains deviation of up to +/-15 percent of the nominal input voltage

d) Modular Assembly: The rectifier/battery charger assembly shall be constructed of modular design to facilitate rapid maintenance.

e) Charging Levels: The battery charging shall keep the DC bus float voltage of +/- 220v, +/-1 percent

f) Battery Charge Current Limit: The UPS shall be capable of limiting the energy sourced from the mains for purposes of battery charging. As a default setting, the battery charge energy will be set to 100 percent of its nominal value. When signaled by a dry contact, (such as from an emergency generator) the UPS shall be capable of limiting the battery charge energy taken from the mains. This shall take place in user selectable increments of 75 percent, 50 percent, 25 percent, 10 percent and 0 percent of the nominal charge power. The selection shall be made from the UPS front panel display/control unit.

g) Temperature Compensated Charging: The battery charger shall be equipped with a temperature probe to enable temperature compensated charging and adjust the battery float voltage to compensate for the ambient temperature using a negative temperature coefficient of 3 mV per cell per degree Celsius at a nominal temperature of 25 deg. C.

h) Capacity: The rectifier/battery charger shall have sufficient capacity to support a fully loaded inverter and fully recharge the battery to 95 percent of its full capacity within 6-8 hours.

2. Inverter:

a. The UPS output shall be derived from a Pulse Width Modulated (PWM) IGBT inverter design. The inverter shall be capable of providing the specified precise output power characteristics (specified in section 2.2.C) while operating over the battery voltage range. The inverter assembly shall be constructed as a modular assembly to facilitate rapid maintenance.

3. Static Bypass:

a. As part of the UPS, a system static bypass switch shall be provided. The system static bypass shall provide no break transfer of the critical load from the Inverter output to the static bypass input source during times where maintenance is required, or the inverter cannot support the critical bus. Such times may be due to prolonged or severe overloads, or UPS failure.

H. Uninterrupted Transfer: The static bypass transfer switch shall automatically cause the bypass source to assume the critical load without interruption after the logic senses one of the following conditions:

1. Inverter overload exceeds unit's rating.
2. Battery protection period expired and bypass current is available.
3. Inverter failure.

I. Interrupted Transfer: If the bypass source is beyond the conditions stated below, the UPS will make an interrupted transfer (not less than 500 msec. in duration).

1. Bypass voltage greater than + 10 percent, -10 percent from the UPS rated output voltage.
2. Bypass frequency greater than + 2 Hz from the UPS rated output frequency.

J. Automatic Uninterrupted Forward Transfer: The static bypass transfer switch shall automatically forward transfer power from the bypass to the rectifier / inverter, without interruption, after the UPS inverter is turned "ON", after an instantaneous overload-induced reverse transfer has occurred and the load current returns the UPSs nominal rating or less.

K. Manual Transfer: A manual static transfer shall be initiated from the UPS Control Panel by turning the UPS inverter off.

L. Overload Ratings: The static bypass transfer switch shall have the following overload characteristics after which time a thermal protection device will engage to protect the static bypass.

1. 800 percent of UPS output rating for 0.5 seconds (one cycle).
2. 150 percent for 30 seconds.
3. 125 percent of UPS output rating continuous.

M. Microprocessor Controlled Logic:

1. The full UPS operation shall be provided through the use of microprocessor controlled logic. All operation and parameters are firmware controlled, thus eliminating the need for manual adjustments or potentiometers. The logic shall include a self-test and diagnostic circuitry such that a fault can be isolated down to the printed circuit assembly or plug-in power assembly level. Every printed circuit assembly or plug-in power assembly shall be monitored. Diagnostics shall be performed via a PC through the local diagnostics port on the UPS.

N. Standard Communication Panel:

1. The UPS will include a standard easy to use communication panel. Included will be a backlit, color graphic animated LCD display, LED’s and audible indicators for UPS On line, UPS fault, UPS on battery and UPS off line. The UPS communication panel will include UPS “ON” and UPS “OFF” pushbuttons that will permit the user to safely command the UPS on or off without risk of load loss.

2.02 SYSTEM CONTROLS AND INDICATORS

A. Display Unit: A microprocessor controlled display unit shall be located on the front of the system. The display shall consist of an alphanumeric display with backlight, an alarm LED, and a keypad consisting of pushbutton switches. The following metered data, shall be available on the alphanumeric display:

1. Measurements, status indications and events.
2. Bar-graphs and waveforms of the measured values.
3. Personalization menu protected by a password, used to make specific settings.
4. Event log with time stamping.
5. Access to all measurements.

B. System Parameters Monitored (data displayed): The visual display will display the following system parameters based on true RMS metering:

1. Measurements:

    a. Year, Month, Day, Hour, Minute, Second of occurring events.
    b. Source Input Voltage
    c. Input Frequency
    d. Output AC voltage
    e. Output AC current

2. Status indications and events:

    a. Static bypass switch on
    b. EPO Active
    c. Mechanical bypass activated
    d. External bypass switch (Q3) activated
    e. Battery discharged
    f. Return from low battery
    g. Low battery
    h. Load not powered from UPS
    i. UPS in bypass
    j. Runtime calibration aborted
    k. Runtime calibration started
    l. Runtime calibration complete
    m. Battery self test aborted
    n. Battery self test started
    o. Battery self test completed
    p. Number of battery modules decreased
    q. Number of battery modules increased
    r. Fan fault
    s. SBS fault
    t. System not in sync.
    u. Bypass not available, frequency/voltage out of range
    v. Mains voltage/frequency out of range
    w. Site wiring fault
    x. Low battery voltage shut down
    y. Defective battery detected
    z. Runtime is below alarm threshold
    aa. Load is above alarm threshold
    bb. Battery over-voltage warning
    cc. Battery over-temperature warning
    dd. Emergency power supply fault
    ee. Output overloaded

3. Display of operating curves: The graphical display shall be capable of displaying curves and bar graphs of the above-mentioned measured values for significant periods.

4. Time-stamped historical events: This function shall time-stamp and store all important status changes, anomalies and faults and make this information available for automatic or user-requested consultation; it shall interpret the events and indicate remedial measures if applicable.

C. Controls: The following controls or programming functions shall be accomplished by use of the display unit. Pushbutton membrane switches shall facilitate these operations.

1. Silence audible Alarm

2. Set the alphanumeric display language
3. Display or set the date and time
4. Enable or disable the automatic restart feature
5. Transfer critical load to and from static bypass
6. Test battery condition on demand
7. Set intervals for automatic battery tests
8. Adjust set points for different alarms
9. Program the parameters for remote shutdown.

D. Front Panel Interface: The following shall make up the UPS front panel user interface.

1. Load On: When Green, this LED indicates the load is being supported by the UPS output
2. On Battery: When Yellow, this LED indicates the UPS is running from Battery power
3. Bypass: When Yellow, this LED indicates the load is being supported by static bypass/mechanical bypass
4. Bypass: When Yellow, this LED indicates the load is being supported by static bypass/mechanical bypass

E. Push Button User Controls

1. Up Arrow
2. Down Arrow
3. Help Key
4. Escape Key
5. Enter Key

F. Emergency Power Off (EPO): The UPS shall be equipped with a local emergency power off button and dry contact input that can be used to command UPS shut down remotely. Activation of this command shall lead to the following actions:

1. Inverter shutdown
2. Opening of the static bypass switch and the battery circuit breaker
3. Opening of an isolated dry contact on the programmable relay board

G. RJ-45 Interface port for remote communications with a network via web browser or SNMP.

H. Dry Contacts: The UPS shall be provided standard with a programmable input/output relay board. This board shall have 8 dry contacts, i.e. 6 for input signals and 2 for output signals. Contacts shall be programmed as:

1. Low battery
2. Load on battery power
3. Load on automatic bypass
4. Load on UPS
5. Common Fault
6. UPS Off

The contacts will be programmable normally open or normally off and will change state to indicate the operating status. The contacts will be rated at 2.0 A (250 VDC / 30 VDC).

2.03 MECHANICAL DESIGN AND VENTILATION

A. Enclosure: The UPS shall be housed in a freestanding enclosure with dead front construction. The mechanical structure of the UPS shall be sufficiently strong and rigid to withstand handling

and installation operations without risk. Access to UPS subassemblies shall be through the front or top. The sheet-metal elements in the structure shall be protected against corrosion by a suitable treatment, such as zinc electroplating, bichromating, epoxy paint or an equivalent.

B. Cable Access: The standard UPS shall accommodate top or bottom entry cables.

C. Cabinet Weights and Dimensions: The width of the UPS System is 32.8 (in Inches) and has an approximate weight of 1050 lbs.

D. Ventilation and Heat Rejection: The UPS shall be designed for forced air-cooling. Air inlets shall be provided from the front bottom of the UPS enclosure. Air exhaust shall be from the top rear portion of the unit. Full load heat rejection is 4777 BTU /hour.

2.04 ACCESSORIES

A. External Control and Communications Devices

1. The following control and communications devices shall be provided in the UPS module.

B. Network Adaptor:

1. The Ethernet Web/SNMP Adaptor shall allow one or more network management systems (NMS) to monitor and manage the UPS in TCP/IP network environments. The management information base (MIB) shall be provided in DOS and UNIX "tar" formats. The SNMP interface adaptor shall be connected to the UPS via the RS232 serial port on the standard communication interface board.

2. The UPS, in conjunction with a network interface card, shall be capable of gracefully shutting down one or more operating systems during when the UPS is on reserve mode.

3. The UPS shall also be capable of using an RS232 port to communicate by means of serial communications to gracefully shut down one or more operating systems during an on battery situation.

C. Remote UPS Monitoring

1. The following three methods of remote UPS monitoring shall be available:

2. Web Monitoring: Remote monitoring shall be available via a web browser such as Internet Explorer.
RS232 Monitoring: Remote UPS monitoring shall be possible via either RS232 or contact closure signals from the UPS.

3. Simple Network Management Protocol (SNMP): Remote UPS Monitoring shall be possible through a standard MIB II compliant platform.

PART 3 - EXECUTION

3.01 FACTORY ASSISTED START-UP

A. Factory trained service personnel shall perform the following inspections, test procedures, and on-site training:

B. Visual Inspection:

1. Inspect equipment for signs of damage.
2. Verify installation per manufacturer's instructions.
3. Inspect cabinets for foreign objects.
4. Inspect Battery Units.
5. Inspect Power Module(s).

C. Mechanical Inspection:

1. Check all UPS and external maintenance bypass cabinet internal power wiring connections.
2. Check all UPS and external maintenance bypass cabinet terminal screws, nuts, and/or spade lugs for tightness.

D. Electrical Inspection:

1. Verify correct input and bypass voltage.
2. Verify correct phase rotation of all mains connections.
3. Verify correct UPS control wiring and terminations.
4. Verify voltage of all battery modules.
5. Verify neutral and ground conductors are properly landed.

E. Site Testing:

1. Ensure proper system start-up.
2. Verify proper firmware control functions.
3. Verify proper firmware bypass operation.
4. Verify proper maintenance bypass switch operation.
5. Verify system set points.
6. Verify proper inverter operation and regulation circuits.
7. Simulate utility power failure.
8. Verify proper charger operation.
9. Document, sign, and date all test results.

F. On-Site Operational Training: During the factory assisted start-up, operational training for site personnel shall include key pad operation, LED indicators, start-up and shutdown procedures, maintenance bypass and AC disconnect operation and alarm information.

3.02 FIELD QUALITY CONTROL & SERVICE ORGANIZATION

A. Field Service Engineer Qualifications

1. The manufacturer must employ a 7 X 24 nationwide field service organization with rapid access to all regions of the nation. The responding service professionals must be factory-trained engineers with an accredited and proven competence to service three phase UPS systems.

B. Spare Parts

1. Field Engineers must have immediate access to recommended spare parts with additional parts storage located in regional depots. Additional spare parts shall be accessible on a 7 x 24 basis from the national depot and must be expedited on a next available flight basis or via direct courier (whichever mode is quickest).

C. Maintenance Training

1. The manufacturer shall make available to the customer various levels of training ranging from basic UPS operation to UPS maintenance.

D. Maintenance & Service Contracts

1. The manufacturer shall offer additional preventative maintenance and service contracts covering both the UPS system and the battery bank. Accredited professional service engineers, employed exclusively in the field of critical power systems service shall perform all maintenance and service. The manufacturer shall also offer extended warranty contracts.

E. Owner Training: Provide four hours of Owner training after system start up.

COPY OF EXISTING UPS MODEL INFORMATION ON NEXT PAGE:

O&M Manual Package **DATE: 10/27/2010**

Manufacturers Representative for

MITSUBISHI ELECTRIC

THREE Phase Uninterruptible Power Systems Mitsubishi Sales Oder SU04456
TWO MODEL 2033C UPS SYSTEMS:
Location UPS-CDP: One 20KVA/16KW System W / 240+ Mins Battery Backup at Full Load
Location UPS-CP: One 20KVA/16KW System W / 11 Mins Battery Backup at Full Load
Input/Output Voltage: 120/208V Three Phase Wye
Project Reference: Nantucket Public Safety Facility

UPS-CDP Location

20KVA/16KW UPS WITH 240 Minute Battery SYSTEM DETAILS

SN 10-7M73181-04

	Qty	Item Description
M23C-02014-24B00C	1	Mitsubishi 20KVA/16KW Solid State On Line Double Conversion Three Phase 120/208V UPS Electronics Module with internal Static Bypass and Internal Zero Energy Maintenance Bypass. Internal EPO and REPO contacts, Diamond Sense Battery Self Test and Monitoring,
Thermocouple	1	Thermocouple for automatic temperature compensated battery charging. (connection and installation by Installer)
1MC8-30P150-020B3	2	Battery Cabinets (2 strings) Each with a DC CB and VRLA batteries. Combined battery cabinets provide 240+ minutes of battery backup to 20KVA/ 16KW load on the output of the UPS Electronics module.
NETCOM2SEC	1	SNMP Network Communications Kit. (connection to UPS by Startup FE, connection to customer equipment not provided. Phone assistance for setup of communications provided.
	Lot	Two (2) Year On-Site Electronics Warranty - Parts & Labor on Electronics. On site battery warranty year one, Battery as parts only during year two
	Lot	On-Site System Startup Weekday non holiday. Operational Traiing same day.

20KVA/16KW System Dimensions (Each Module)

Item	Qty	Dimensions	Weight (lbs.)
UPS Module	1	17.7"w x 31.5"d x 43.3"h	410 lbs.
Battery Cabinets	2	36"w x 29.5"d x 78.7"h	3705 lbs. EACH CABINET

END OF SECTION 263353

CONSULTANTS:

Electrical Engineer:

GARCIA·GALUSKA·DESOUSA
CONSULTING ENGINEERS INC.
370 Faunce Corner Road, Dartmouth, MA 02747-1271
508-998-5700 • FAX 508-998-0883 • E-MAIL info@g-g-d.com

OWNER:

TOWN OF NANTUCKET, MASS. • INCORPORATED 1671 •

Nantucket Police Station
Nantucket, MA

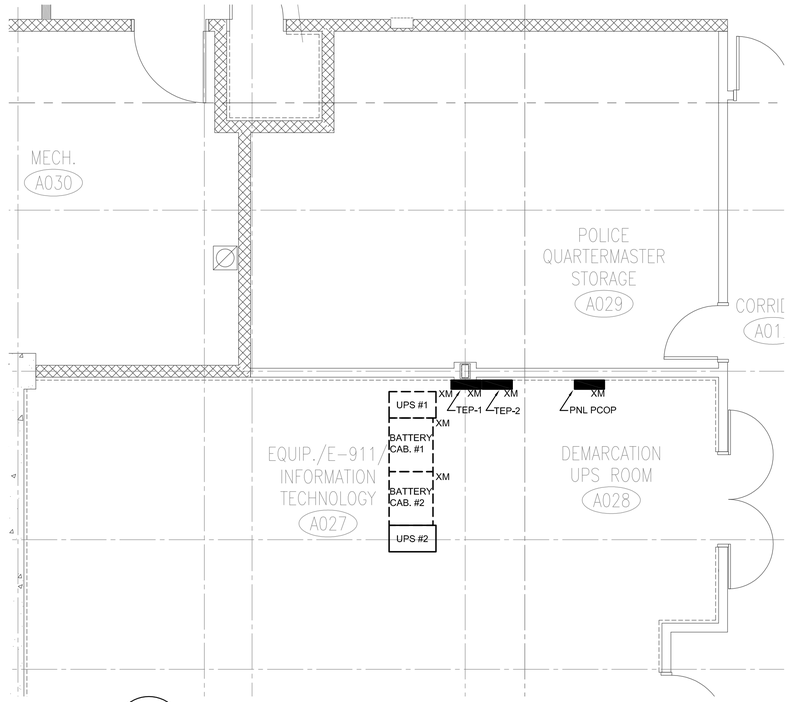
PROJECT: DISPATCH CENTER UPS

DATE: FOR BIDS DUE 2/2/2016

DRAWING LIST:

ELECTRICAL:

E1.0 ELECTRICAL - FLOOR PLAN & RISER



1 / E1.0 EQUIP/TECHNOLOGY A027/A028 RM PART PLAN

SCALE: 1/4" = 1'-0"

BRANCH CIRCUIT NOTES:

1. COORDINATE EXACT LOCATION OF ALL DEVICES AND EQUIPMENT W/ENGINEER PRIOR TO INSTALLATION.
2. WIRING IS SHOWN ON DRAWINGS ONLY FOR SPECIFIC ROUTES OR SPECIAL CONDITIONS.
3. WIRING AND CONDUIT SHALL BE REQUIRED BETWEEN ALL OUTLETS INDICATED WITH CIRCUIT NUMBERS AND PANEL DESIGNATIONS.
4. ALTHOUGH ALL BRANCH CIRCUIT WIRE AND CONDUIT IS NOT SHOWN, IT IS THE INTENT OF THESE DOCUMENTS THAT A COMPLETE BRANCH CIRCUIT WIRING SYSTEM BE INSTALLED.
5. ALL BRANCH CIRCUIT CONDUCTORS SHALL BE 98% CONDUCTIVITY, COPPER MINIMUM #12 AWG SIZE, THWN/THHN INSULATION. 600 VOLTS RATED UNLESS OTHERWISE NOTED.
6. DO NOT PENETRATE STAIRS WITH ANY UTILITIES EXCEPT FOR UTILITIES SPECIFICALLY SERVING THAT STAIR.
7. E.C. SHALL F&I NEW BRANCH CIRCUIT BREAKERS (TO MATCH EXISTING), AS INDICATED IN THE MECHANICAL SCHEDULE, IN EXISTING PANELBOARDS AS REQUIRED.

ABBREVIATIONS

C	CONDUIT (GENERIC TERM FOR RACEWAY. PROVIDE AS SPECIFIED)
EC	ELECTRICAL SUBCONTRACTOR
F&I	FURNISHED AND INSTALLED
G,GND	GROUND
PC	PLUMBING CONTRACTOR
HVAC	HEATING, VENTILATING, AND AIR CONDITIONING CONTRACTOR
GC	GENERAL CONTRACTOR & HVAC CONTRACTOR IS ONE AND THE SAME.
MFR	MANUFACTURER

POWER

- 120/208 VOLT, 3 PHASE, 4 WIRE PANELBOARD.
- J / D — JUNCTION BOX - SIZE AS REQUIRED.
- PB — PULL BOX - SIZE AS REQUIRED.

WIRE AND RACEWAYS

- WIRING AND RACEWAY - NO. OF DIAGONAL LINES INDICATES NO. #12 AWG CONDUCTORS. ABSENCE OF DIAGONAL LINES INDICATES 2#12 AWG+#12AWG GROUND UNLESS NOTED OTHERWISE. GROUND WIRE IS NOT SHOWN IN COUNT BUT SHALL BE PROVIDED.
- HOMERUN TO PANEL - NO. OF ARROWS INDICATES NO. OF 20 AMP/1 POLE CIRCUITS TO PANEL - UNLESS NOTED OTHERWISE.
- FLEXIBLE CONNECTION TO EQUIPMENT

MOVE THE BELOW CIRCUITS TO PANEL TEP-2

PANEL TEP-1

CKT #	DESCRIPTION
1	QUAD OUTLET - A027 CABLE TRAY DATA CTR
2 / 4	250V TWISTLOCK OUTLT - A027 CABLE TRAY DATA CTR
3	QUAD OUTLET - A027 CABLE TRAY DATA CTR
5	QUAD OUTLET - A027 CABLE TRAY DATA CTR
18	QUAD OUTLET - A027 HEAD END ROOM
19	QUAD OUTLET - A027 CABLE TRAY DATA CTR
20	QUAD OUTLET - A027 HEAD END ROOM
21	QUAD OUTLET - A027 CABLE TRAY DATA CTR
22	QUAD OUTLET - A027 HEAD END ROOM
23	125V TWISTLOCK OUTLET - A027 CABLE TRAY DATA CTR
32	125V TWISTLOCK OUTLET - A241 CABLE TRAY IDF ROOM
34	125V TWISTLOCK OUTLET - A241 CABLE TRAY IDF ROOM
36	QUAD OUTLET - A241 CABLE TRAY IDF ROOM

MOVE THE BELOW CIRCUITS TO PANEL TEP-1

PANEL TEP-2

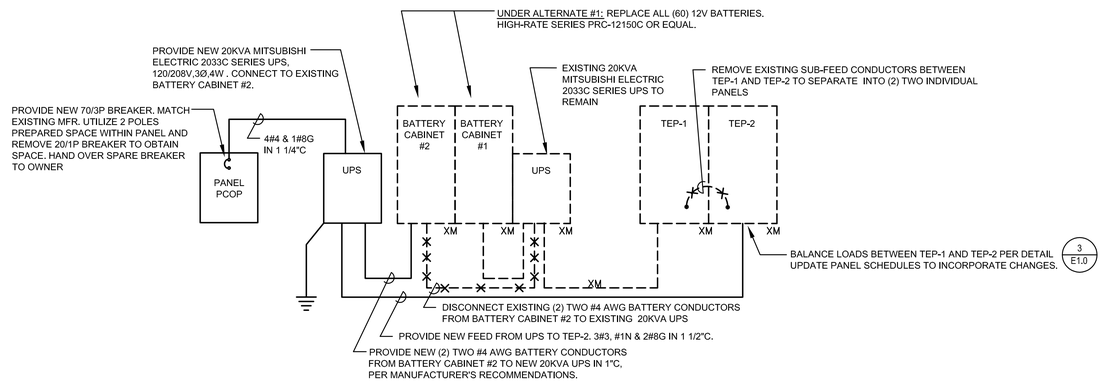
CKT #	DESCRIPTION
43	OUTLET - A129 TV DISPATCH
44	OUTLET - A129 SMALL DISPATCH DESK
45	OUTLET - A129 LARGE DISPATCH DESK
46	OUTLET - A129 SMALL DISPATCH DESK
47	OUTLET - A129 LARGE DISPATCH DESK
48	OUTLET - A129 SMALL DISPATCH DESK

3 / E1.0 TEP-1 & TEP-2 LOAD BALANCING/CIRCUIT RELOCATING

SCALE: NTS

NOTE:

1. CONTRACTOR SHALL BALANCE EACH PHASE WITHIN 5% FOR EACH UPS (BOTH NEW AND EXISTING) AT PANELS TEP-1 AND TEP-2.
2. CONTRACTOR SHALL RE-LABEL THE RECEPTACLES BEING SERVED WITH NEW PANEL, CKT # AND PHASE. PROVIDE MACHINE GENERATED LABELS. HAND WRITTEN LABELS ARE NOT ACCEPTABLE.



2 / E1.0 UPS ONE-LINE RISER DIAGRAM

SCALE: NTS

NO.	DATE	DESCRIPTION	BY

REVISIONS

GARCIA•GALUSKA•DESOUSA INC.
CONSULTING ENGINEERS
370 FAUNCE CORNER ROAD, DARTMOUTH, MA 02747-1271
508 998 5700 • FAX 508-998-0883 MAIL info@g-g-d.com

DRAWN BY: STO
CHECKED BY: DMP
SCALE: AS NOTED
DATE: 6-26-2015

TITLE: ELECTRICAL - FLOOR PLAN & RISER
PROJECT: NPS - DATA CENTER UPS
CLIENT: TOWN OF NANTUCKET
JOB NO.
DWG. NO. E1.0

AGREEMENT BETWEEN
THE TOWN OF NANTUCKET, MASSACHUSETTS
CONTRACTOR

THIS AGREEMENT made effective _____ , 2014 by and between the TOWN OF NANTUCKET, MASSACHUSETTS a municipal corporation, acting by and through its Town Administration, with offices at 16 Broad Street, Nantucket, Massachusetts 02554 (hereinafter called the "TOWN"), **CONTRACTOR.** and whose principal office address and state of incorporation are as set forth on Attachment 'A' (hereinafter called the "CONTRACTOR").

RECITALS

WHEREAS, the TOWN desires to retain the CONTRACTOR to provide certain services for the TOWN, as described below, and the CONTRACTOR is willing to accept such engagement, all on the terms hereinafter set forth,

NOW, THEREFORE, in consideration of the mutual covenants hereinafter set forth, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

[redacted]ENGAGEMENT OF THE CONTRACTOR

A.1 The TOWN hereby engages the CONTRACTOR, and the CONTRACTOR hereby accepts the engagement to perform certain services for the TOWN, as described in Article 2.

A.2 In the performance of any service under this Agreement, the CONTRACTOR acts at all times as an independent contractor. There is no relationship of employment or agency between the TOWN, on the one hand, and the CONTRACTOR, on the other, and the TOWN shall not have or exercise any control or direction over the method by which the CONTRACTOR performs its work or functions aside from such control or directions which are consistent with the independent contractor relationship contemplated in the Agreement.

[redacted]SERVICES OF THE CONTRACTOR

B.1 The CONTRACTOR will perform the services described in the Scope of Services set forth on Attachment 'A' (the "Work").

B.2 The CONTRACTOR shall report, and be responsible, to the TOWN and its designee as set forth on Attachment 'A'.

B.3 There shall be no amendment to the Scope of Services or Work provided for in this Agreement without the written approval of the TOWN. The TOWN shall be under no

obligation to pay for any services performed by the CONTRACTOR which are not explicitly agreed to by the TOWN in writing.

B.4 The CONTRACTOR represents and warrants to the TOWN that the CONTRACTOR (including all of its personnel, whether employees, agents or independent contractors) will be qualified and duly licensed (if necessary) to perform the services required by this Agreement and further agrees to perform its services in a professional manner, and in accordance with the reasonable standard of care implied by law and all applicable local, state or federal ordinances, laws, rules and regulations, all of which are incorporated herein by reference. The CONTRACTOR will obtain and pay for any and all permits, bonds and other items required for the proper and legal performance of the Work.

B.5 The CONTRACTOR represents and warrants to the TOWN that it is not a party to any agreement contract or understanding which would in any way restricts or prohibits it from undertaking or performing its obligations hereunder in accordance with the terms and conditions of this Agreement.

B.6 All written materials and any other documents (whether in the form of “hard” copies, graphics, magnetic media or otherwise) which are received and produced by the CONTRACTOR pursuant to this Agreement shall be deemed to be “work for hire” and shall be and become the property of the TOWN upon the receipt and production of such items by the CONTRACTOR. The TOWN acknowledges that such materials are being prepared with respect to the specific project contemplated hereby and that any reuse of such materials by the TOWN in connection with any other project shall be at the TOWN’s sole risk, unless otherwise agreed to by the CONTRACTOR in writing.

B.7 The CONTRACTOR shall be responsible for the professional and technical accuracy, and for the coordination, of all designs, drawings, specifications, estimates and other work or services furnished by CONTRACTOR or its consultants and subcontractors. The CONTRACTOR shall perform its work under this Agreement in such a competent and professional manner that detail checking and reviewing by the TOWN shall not be necessary. The CONTRACTOR shall supervise and direct the Work, using its best skills and attention, which shall not be less than such state of skill and attention generally rendered for projects similar to the subject project in scope, difficulty and location.

B.8 The CONTRACTOR shall not use any subcontractors or sub-consultants (not identified herein) for any work required under this Agreement unless such use has been approved in advance in writing by the TOWN.

B.9 Notwithstanding anything to the contrary in this Agreement, the CONTRACTOR shall not be relieved of its obligations under this Agreement by the TOWN’s performance, or failure to perform, any of the TOWN’s administrative duties under this Agreement, including, but not limited to, the TOWN’s review and/or approval of plans, estimates, programs, documents, materials, work and services furnished by CONTRACTOR.

[redacted]PERIOD OF SERVICES

C.1 Unless otherwise provided on Attachment 'A', the term of this Agreement shall commence on the date hereof and continue until the Work is completed to the TOWN's reasonable satisfaction.

C.2 The CONTRACTOR shall proceed with the Work promptly after receiving Notice to Proceed and will diligently and faithfully prosecute the Work to completion in accordance with the provisions hereof. In any event, the Work shall be completed no later than the date set forth on Attachment 'A'. The CONTRACTOR acknowledges that time is of the essence of this Agreement.

C.3 If the CONTRACTOR is delayed in the performance of any of its obligations under this Agreement by the occurrence of an unforeseen event beyond its control such as fire or other casualty, abnormal adverse weather conditions, acts of God (collectively, "Unavoidable Events") which materially and adversely affect its ability to perform the Work, then the time for the CONTRACTOR to perform the Work shall be extended for such time as the TOWN shall reasonably determine is necessary to permit the CONTRACTOR to perform in light of the effects of the Unavoidable Event.

C.4 If an Unavoidable Event occurs which, in the TOWN's reasonable determination, makes the performance of the Agreement impossible without the expenditure of additional TOWN funds, the TOWN may, at its option, elect to terminate this Agreement upon thirty (30) days written notice.

[redacted]PAYMENTS TO THE CONTRACTOR

D.1 The compensation due to the CONTRACTOR shall be paid in the amounts, and in the manner, set forth on Attachment 'B', attached hereto.

D.2 The CONTRACTOR will invoice the TOWN at the completion of the work unless otherwise provided on Attachment 'B', with one or more invoices broken down to show the quantity of work performed and the percentage of the entire project completed, categories and amount of reimbursable expenses (if any), and provide such supporting data as may be required by the TOWN.

D.3 The TOWN will pay the CONTRACTOR for completed satisfactory work upon review and approval of such invoices by the TOWN or its designee.

D.4 This engagement may be subject to budgetary restrictions which may limit the total amount of funds available for the Work. Accordingly, unless otherwise stated on Attachment 'B', the TOWN will not be obligated to pay any amount in excess of the maximum project amount without the express written approval of the TOWN.

D.5 The CONTRACTOR and its sub-contractors shall not be compensated for any services involved in preparing changes that are required for additional work that should have

been anticipated by the CONTRACTOR in the preparation of the documents, as reasonably determined by the TOWN.

[redacted]TERMINATION

E.1 This Agreement may be terminated, with cause, by either the TOWN or CONTRACTOR, upon written notice given by the non-defaulting party. For the purposes of this provision, "cause" shall include the failure of a party to adhere to the terms of this Agreement or fulfill its material duties hereunder in a timely and proper manner.

E.2 The TOWN shall have the right to terminate this Agreement for its convenience and without cause upon ten (10) days written notice.

E.3 Following termination of this Agreement, the parties shall be relieved of all further obligations hereunder except that:

unless the TOWN terminates for cause under paragraph 5.1, in which event the TOWN shall be under no obligation to make any payments to CONTRACTOR except for those services satisfactorily provided, the TOWN shall remain responsible for payments for the services satisfactorily performed and, unless this Agreement is for a lump-sum, expenses of CONTRACTOR reasonably accrued prior to the effective date of the notice of termination in compliance with this Agreement (less the value of any claims of the TOWN), all as determined by the TOWN in its sole discretion, but for no other amounts, including, without limitation, claims for lost profits on Work not performed; and

The CONTRACTOR shall remain liable for any damages, expenses or liabilities arising under this Agreement (including its indemnity obligations) with respect to WORK performed pursuant to the Agreement.

[redacted]INSURANCE

F.1 The CONTRACTOR agrees to indemnify and save the TOWN harmless from any and all manner of suits, claims, or demands arising out of any errors, omissions or negligence by CONTRACTOR (including all its employees, agents and independent contractors) in performing the Work, or any breach of the terms of this Agreement by such CONTRACTOR and shall reimburse the TOWN for any and all costs, damages and expenses, including reasonable attorney's fees, which the TOWN pays or becomes obligated to pay, by reason of such activities, or breach. The provisions of this Section 6.1 shall be in addition to, and shall not be construed as a limitation on, any other legal rights of the TOWN with respect to the CONTRACTOR, in connection with this Agreement, and shall survive termination or expiration of this Agreement.

F.2 Before commencing work the CONTRACTOR shall obtain and maintain at its expense and from insurance companies of a Best Rating of A or better, which are licensed to do business in the Commonwealth of Massachusetts, insurance as set forth below. If the CONTRACTOR is permitted to sub-contract a material portion of the Work, or is otherwise identifying a third party to perform services for the Town, the CONTRACTOR shall assure that such sub-contractor or other third party also has such insurance. The CONTRACTOR shall provide:

Workers' Compensation, covering the obligations of the CONTRACTOR in accordance with applicable Workers' Compensation or Benefits laws.

Commercial General Liability Insurance on an occurrence basis with a combined single limit of not less than $1 million. Coverage is to include premises and operations, coverage for liability of subcontractors. The policy shall contain an endorsement stating that the aggregate limits will apply separately to the work being performed under this Agreement.

If vehicles are used in performing the Work, automobile liability insurance of not less than $1 million combined single limit covering owned, hired and non-hired vehicles.

Such additional insurance as may be required by law to be carried by the CONTRACTOR.

Such additional insurance as the TOWN may reasonably require, as set forth on Attachment ‘A’.

F.3 CONTRACTOR shall maintain such insurance during the term of Agreement and give the TOWN twenty (20) days written notice of any change or cancellation of coverage. Each insurer providing policies hereunder shall waive its rights to subrogate claims against the TOWN. The TOWN will be added as an additional named insured with respect to each such policy and such endorsement shall be reflected on a Certificate of Insurance to be delivered to the TOWN upon the execution of this Agreement and at such times thereafter as the TOWN may reasonably request.

[redacted] PREVAILING WAGE

G.1 The Work subject to this Agreement is covered under the Massachusetts Prevailing Wage Law, G.L. c. 149, §§ 26 - 27 which establishes minimum wage rates for workers on public construction projects. The applicable prevailing wage rates are included in Attachment ‘E’.

G.2 During the Work, it is the Contractor's responsibility to submit weekly payroll records to the Town. Weekly payroll report forms are included in Attachment ‘F’. All information set forth on the form must be provided.

G.3 The Town is prohibited by law for making payments to the Contractor for the Work completed without completed payroll records noted herein.

[redacted]WARRANTY

H.1 One (1) year warranty for parts and labor shall be included.

H.2 Any warranty disclaimer for fitness for a particular purpose and warranty of merchantability shall be void.

[redacted]GENERAL PROVISIONS

I.1 Upon the expiration or the termination of this Agreement for any reason, all data, drawings, specifications, reports, estimates, summaries and other work product which have been accumulated, developed or prepared by the CONTRACTOR (whether completed or in process) shall become the property of the TOWN upon payment for such to the CONTRACTOR and the CONTRACTOR shall immediately deliver or otherwise make available all such material to the TOWN.

I.2 Neither party may assign, transfer or otherwise dispose of this Agreement or any of its rights hereunder or otherwise delegate any of its duties hereunder without the prior written consent of the other party, and any such attempted assignment or other disposition without such consent shall be null and void and of no force and effect.

I.3 This Agreement, together with Attachment ‘A’ (Contractor, Scope of Work, Term), Attachment ‘B’ (Payments), Attachment ‘C’ (Tax Compliance Certificate), Attachment ‘D’ (Certificate of Non-Collusion), Attachment ‘E’ (Prevailing Wage requirements), Attachment ‘F’ (Prevailing Wage Payroll Report), and any additional Attachments referred to herein, constitute the entire agreement of TOWN and CONTRACTOR with respect to the matters set forth therein and may not be changed, amended, modified or terms waived except by a writing signed by TOWN and CONTRACTOR. If there is any conflict among the terms set forth in the body of this Agreement and the terms or provisions set forth in the Attachments hereto, or in any other document or law incorporated by reference herein, the terms or provisions contained therein shall be interpreted with the following hierarchy, with the topmost document of the highest priority:

Applicable federal, state and local laws, rules and regulations.

Amendments to this Agreement, if any.

Attachments ‘A’, ‘B’, ‘C’, ‘D’, ‘E’ and ‘F’.

This Agreement.

Any other Attachments to this Agreement.

I.4 To the extent the conflict is not resolved by applying the above hierarchy, the conflict shall be resolved in a manner that results in the highest quantity and best quality of goods and services to the TOWN.

I.5 This Agreement is governed by the laws of The Commonwealth of Massachusetts and shall be construed in accordance therewith. The parties agree that exclusive jurisdiction for any action arising out of or relating to this Agreement shall lie within courts for Nantucket County, Massachusetts and or the U.S. District Court for Massachusetts and the parties hereby irrevocably waive, to the fullest extent permitted by law, any objection which they may now or hereafter have to the venue of any proceeding brought in such location and further irrevocably waive any claims that any such proceeding has been brought in an inconvenient forum.

I.6 Any notices required or allowed shall be to the Contractors address as noted herein or the Towns address above by certified mail, return receipt requested.

I.7 Notwithstanding anything to the contrary in this Agreement, this Agreement is subject to the appropriation and availability of funds.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement the day and year first written above.

FOR THE CONTRACTOR:

FOR THE TOWN:

C. Elizabeth Gibson, Town Manager

_____ _____
Signature

_____
Printed Name Title

DATE: _____ DATE: _____

CONTRACTOR FEDERAL TAX EIN: _____

DEPARTMENT ORG/OBJ:

_____ _____
Finance Department Date

Name of Contractor: Ha

Contractor Address:

State of Incorporation:

Project Scope:

PAYMENTS

[redacted]Maximum Project Amount:

Payment Increment: Payments made upon satisfactory completion of the work and submission of invoice with prevailing wage compliance forms.

Reimbursable Expenses: None

Pursuant to M.G.L. 62C, Sec.49A, the undersigned certifies under the penalties of perjury that it, to the best knowledge and belief of management, has filed all state tax returns and paid all state taxes required under law (if any, are so required).

FOR THE CONTRACTOR:

Signature

Printed Name Title

Date

CONTRACTOR TAX EIN:_____

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

FOR THE CONTRACTOR:

_____
Signature

_____
Printed Name Title

_____
Date

CONTRACTOR TAX EIN:_____

PREVAILING WAGE LAW RATES

The following pages list wage rates for this project pursuant to the Massachusetts Prevailing Wage Law, G.L. c. 149, §§ 26 - 27; c. 5, § 1; c. 71, § 7A and c. 121B, § 29B.

PREVAILING WAGE LAW FORMS

The following forms required to be submitted for payment pursuant to the Massachusetts Prevailing Wage Law, G.L. c. 149, §§ 26 - 27; c. 5, § 1; c. 71, § 7A and c. 121B, § 29B.

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

RONALD L. WALKER, II
Secretary

WILLIAM D MCKINNEY
Director

Awarding Authority: Town of Nantucket

Contract Number:

City/Town: NANTUCKET

Description of Work: Supply and install new 20KVA/16KW uninterruptible power supply. Includes new power wiring. Reconfigure existing UPS system and split power panels. Modify existing UPS battery storage.

Job Location: 4 Fairgrounds Road

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **If an apprentice rate is not listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAS, the apprentice must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Issue Date: 01/11/2016 **Wage Request Number:** 20160111-041

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2015	$31.65	$10.41	$10.08	$0.00	$52.14
	06/01/2016	$32.15	$10.41	$10.08	$0.00	$52.64
	08/01/2016	$32.15	$10.91	$10.08	$0.00	$53.14
	12/01/2016	$32.15	$10.91	$10.89	$0.00	$53.95
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2015	$31.72	$10.41	$10.08	$0.00	$52.21
	06/01/2016	$32.22	$10.41	$10.08	$0.00	$52.71
	08/01/2016	$32.22	$10.91	$10.08	$0.00	$53.21
	12/01/2016	$32.22	$10.91	$10.89	$0.00	$54.02
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2015	$31.84	$10.41	$10.08	$0.00	$52.33
	06/01/2016	$32.34	$10.41	$10.08	$0.00	$52.83
	08/01/2016	$32.34	$10.91	$10.08	$0.00	$53.33
	12/01/2016	$32.34	$10.91	$10.89	$0.00	$54.14
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$88.29	$9.80	$19.23	$0.00	$117.32
AIR TRACK OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.90	$7.45	$12.65	$0.00	$52.00
	06/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
	12/01/2016	$33.15	$7.45	$12.65	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS WORKER (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)*	12/01/2015	$34.38	$10.40	$5.95	$0.00	$50.73
ASPHALT RAKER *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 2*	12/01/2015	$31.90	$7.45	$12.65	$0.00	$52.00
	06/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
	12/01/2016	$33.15	$7.45	$12.65	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2016	$41.62	$6.97	$16.21	$0.00	$64.80
	01/01/2017	$42.92	$6.97	$16.21	$0.00	$66.10

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$27.05	$6.97	$10.54	$0.00	$44.56
2	65	$27.05	$6.97	$10.54	$0.00	$44.56
3	70	$29.13	$6.97	$11.35	$0.00	$47.45
4	75	$31.22	$6.97	$12.16	$0.00	$50.35
5	80	$33.30	$6.97	$12.97	$0.00	$53.24
6	85	$35.38	$6.97	$13.78	$0.00	$56.13
7	90	$37.46	$6.97	$14.59	$0.00	$59.02
8	95	$39.54	$6.97	$15.40	$0.00	$61.91

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$27.90	$6.97	$10.54	$0.00	$45.41
2	65	$27.90	$6.97	$10.54	$0.00	$45.41
3	70	$30.04	$6.97	$11.35	$0.00	$48.36
4	75	$32.19	$6.97	$12.16	$0.00	$51.32
5	80	$34.34	$6.97	$12.97	$0.00	$54.28
6	85	$36.48	$6.97	$13.78	$0.00	$57.23
7	90	$38.63	$6.97	$14.59	$0.00	$60.19
8	95	$40.77	$6.97	$15.40	$0.00	$63.14

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (NEW BEDFORD)*	08/01/2015	$49.86	$10.18	$18.57	$0.00	$78.61
	02/01/2016	$49.86	$10.18	$19.14	$0.00	$79.18
	08/01/2016	$50.76	$10.18	$19.22	$0.00	$80.16
	02/01/2017	$51.33	$10.18	$19.22	$0.00	$80.73

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 New Bedford*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.93	$10.18	$18.57	$0.00	$53.68
2	60	$29.92	$10.18	$18.57	$0.00	$58.67
3	70	$34.90	$10.18	$18.57	$0.00	$63.65
4	80	$39.89	$10.18	$18.57	$0.00	$68.64
5	90	$44.87	$10.18	$18.57	$0.00	$73.62

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.93	$10.18	$19.14	$0.00	$54.25
2	60	$29.92	$10.18	$19.14	$0.00	$59.24
3	70	$34.90	$10.18	$19.14	$0.00	$64.22
4	80	$39.89	$10.18	$19.14	$0.00	$69.21
5	90	$44.87	$10.18	$19.14	$0.00	$74.19

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$36.45	$7.45	$13.75	$0.00	$57.65
	06/01/2016	$37.20	$7.45	$13.75	$0.00	$58.40
	12/01/2016	$38.20	$7.45	$13.75	$0.00	$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$35.30	$7.45	$13.75	$0.00	$56.50
	06/01/2016	$36.05	$7.45	$13.75	$0.00	$57.25
	12/01/2016	$37.05	$7.45	$13.75	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$35.30	$7.45	$13.75	$0.00	$56.50
	06/01/2016	$36.05	$7.45	$13.75	$0.00	$57.25
	12/01/2016	$37.05	$7.45	$13.75	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 1 (Metro Boston)*	03/01/2015	$42.30	$9.80	$16.48	$0.00	$68.58

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Zone 1 Metro Boston*

Effective Date - 03/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.15	$9.80	$1.63	$0.00	$32.58
2	60	$25.38	$9.80	$1.63	$0.00	$36.81
3	70	$29.61	$9.80	$11.59	$0.00	$51.00
4	75	$31.73	$9.80	$11.59	$0.00	$53.12
5	80	$33.84	$9.80	$13.22	$0.00	$56.86
6	80	$33.84	$9.80	$13.22	$0.00	$56.86
7	90	$38.07	$9.80	$14.85	$0.00	$62.72
8	90	$38.07	$9.80	$14.85	$0.00	$62.72

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (NEW BEDFORD)*	01/01/2016	$46.44	$10.90	$18.71	$1.30	$77.35

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (New Bedford)*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.22	$10.90	$12.21	$0.00	$46.33
2	60	$27.86	$10.90	$13.71	$1.30	$53.77
3	65	$30.19	$10.90	$14.71	$1.30	$57.10
4	70	$32.51	$10.90	$15.71	$1.30	$60.42
5	75	$34.83	$10.90	$16.71	$1.30	$63.74
6	80	$37.15	$10.90	$17.71	$1.30	$67.06
7	90	$41.80	$10.90	$18.71	$1.30	$72.71

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75

For apprentice rates see "Apprentice- LABORER"

CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$44.73	$10.00	$14.90	$0.00	$69.63
	06/01/2016	$45.48	$10.00	$14.90	$0.00	$70.38
	12/01/2016	$46.73	$10.00	$14.90	$0.00	$71.63
	06/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
	12/01/2017	$48.73	$10.00	$14.90	$0.00	$73.63

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$30.13	$10.00	$14.90	$0.00	$55.03
	06/01/2016	$30.65	$10.00	$14.90	$0.00	$55.55
	12/01/2016	$31.52	$10.00	$14.90	$0.00	$56.42
	06/01/2017	$32.21	$10.00	$14.90	$0.00	$57.11
	12/01/2017	$32.90	$10.00	$14.90	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.76	$7.85	$0.00	$0.00	$32.61
2	55	$27.23	$7.85	$3.66	$0.00	$38.74
3	60	$29.71	$7.85	$3.99	$0.00	$41.55
4	65	$32.18	$7.85	$4.32	$0.00	$44.35
5	70	$34.66	$7.85	$14.11	$0.00	$56.62
6	75	$37.13	$7.85	$14.44	$0.00	$59.42
7	80	$39.61	$7.85	$14.77	$0.00	$62.23
8	90	$44.56	$7.85	$15.44	$0.00	$67.85

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.23	$7.85	$0.00	$0.00	$33.08
2	55	$27.75	$7.85	$3.66	$0.00	$39.26
3	60	$30.28	$7.85	$3.99	$0.00	$42.12
4	65	$32.80	$7.85	$4.32	$0.00	$44.97
5	70	$35.32	$7.85	$14.11	$0.00	$57.28
6	75	$37.85	$7.85	$14.44	$0.00	$60.14
7	80	$40.37	$7.85	$14.77	$0.00	$62.99
8	90	$45.41	$7.85	$15.44	$0.00	$68.70

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 2*	12/01/2015	$35.50	$7.45	$13.55	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 2*	12/01/2015	$36.50	$7.45	$13.55	$0.00	$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 2*	12/01/2015	$36.25	$7.45	$13.55	$0.00	$57.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 2* For apprentice rates see "Apprentice- LABORER"	12/01/2015	$36.50	$7.45	$13.55	$0.00	$57.50
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 2* For apprentice rates see "Apprentice- LABORER"	12/01/2015	$36.25	$7.45	$13.55	$0.00	$57.25
DEMO: WRECKING LABORER *LABORERS - ZONE 2* For apprentice rates see "Apprentice- LABORER"	12/01/2015	$35.50	$7.45	$13.55	$0.00	$56.50
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$58.86	$9.80	$19.23	$0.00	$87.89
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$63.06	$9.80	$19.23	$0.00	$92.09
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$88.23	$9.80	$19.23	$0.00	$117.26
ELECTRICIAN *ELECTRICIANS LOCAL 223*	09/01/2015	$38.31	$8.40	$11.28	$0.00	$57.99
	09/01/2016	$39.21	$8.90	$11.51	$0.00	$59.62

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 223*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$15.32	$0.00	$0.46	$0.00	$15.78
2	42	$16.09	$0.00	$0.48	$0.00	$16.57
3	45	$17.24	$8.40	$0.52	$0.00	$26.16
4	48	$18.39	$8.40	$3.36	$0.00	$30.15
5	50	$19.16	$8.40	$3.47	$0.00	$31.03
6	55	$21.07	$8.40	$3.75	$0.00	$33.22
7	60	$22.99	$8.40	$4.03	$0.00	$35.42
8	65	$24.90	$8.40	$4.31	$0.00	$37.61
9	70	$26.82	$8.40	$5.28	$0.00	$40.50
10	75	$28.73	$8.40	$4.86	$0.00	$41.99

Effective Date - 09/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$15.68	$0.00	$0.47	$0.00	$16.15
2	42	$16.47	$0.00	$0.49	$0.00	$16.96
3	45	$17.64	$8.90	$0.53	$0.00	$27.07
4	48	$18.82	$8.90	$3.42	$0.00	$31.14
5	50	$19.61	$8.90	$3.55	$0.00	$32.06
6	55	$21.57	$8.90	$3.83	$0.00	$34.30
7	60	$23.53	$8.90	$4.12	$0.00	$36.55
8	65	$25.49	$8.90	$4.39	$0.00	$38.78
9	70	$27.45	$8.90	$4.68	$0.00	$41.03
10	75	$29.41	$8.90	$4.96	$0.00	$43.27

Notes:

Steps are 750 hours

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2016	$54.53	$14.43	$14.96	$0.00	$83.92
	01/01/2017	$55.86	$15.28	$15.71	$0.00	$86.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.27	$14.43	$0.00	$0.00	$41.70
2	55	$29.99	$14.43	$14.96	$0.00	$59.38
3	65	$35.44	$14.43	$14.96	$0.00	$64.83
4	70	$38.17	$14.43	$14.96	$0.00	$67.56
5	80	$43.62	$14.43	$14.96	$0.00	$73.01

Effective Date - 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.93	$15.28	$0.00	$0.00	$43.21
2	55	$30.72	$15.28	$15.71	$0.00	$61.71
3	65	$36.31	$15.28	$15.71	$0.00	$67.30
4	70	$39.10	$15.28	$15.71	$0.00	$70.09
5	80	$44.69	$15.28	$15.71	$0.00	$75.68

Notes:
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2016	$38.17	$14.43	$14.96	$0.00	$67.56
	01/01/2017	$39.10	$15.28	$15.71	$0.00	$70.09
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2015	$40.49	$10.00	$14.55	$0.00	$65.04
	05/01/2016	$41.38	$10.00	$14.55	$0.00	$65.93
	11/01/2016	$41.97	$10.00	$14.55	$0.00	$66.52
	05/01/2017	$42.85	$10.00	$14.55	$0.00	$67.40
	11/01/2017	$43.58	$10.00	$14.55	$0.00	$68.13
	05/01/2018	$44.29	$10.00	$14.55	$0.00	$68.84
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2015	$41.93	$10.00	$14.55	$0.00	$66.48
	05/01/2016	$42.82	$10.00	$14.55	$0.00	$67.37
	11/01/2016	$43.42	$10.00	$14.55	$0.00	$67.97
	05/01/2017	$44.31	$10.00	$14.55	$0.00	$68.86
	11/01/2017	$45.04	$10.00	$14.55	$0.00	$69.59
	05/01/2018	$45.76	$10.00	$14.55	$0.00	$70.31
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2015	$21.71	$10.00	$14.55	$0.00	$46.26
	05/01/2016	$22.23	$10.00	$14.55	$0.00	$46.78
	11/01/2016	$22.58	$10.00	$14.55	$0.00	$47.13
	05/01/2017	$23.11	$10.00	$14.55	$0.00	$47.66
	11/01/2017	$23.53	$10.00	$14.55	$0.00	$48.08
	05/01/2018	$23.96	$10.00	$14.55	$0.00	$48.51
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 223*	09/01/2015	$38.31	$8.40	$11.28	$0.00	$57.99
	09/01/2016	$39.21	$8.90	$11.51	$0.00	$59.62
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS LOCAL 223*	09/01/2015	$32.56	$8.40	$9.59	$0.00	$50.55
	09/01/2016	$33.33	$8.90	$9.78	$0.00	$52.01
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$36.34	$10.00	$14.90	$0.00	$61.24
	06/01/2016	$36.96	$10.00	$14.90	$0.00	$61.86
	12/01/2016	$38.00	$10.00	$14.90	$0.00	$62.90
	06/01/2017	$38.84	$10.00	$14.90	$0.00	$63.74
	12/01/2017	$39.67	$10.00	$14.90	$0.00	$64.57
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER *LABORERS - ZONE 2*	12/01/2015	$20.50	$7.45	$12.65	$0.00	$40.60
	06/01/2016	$20.50	$7.45	$12.65	$0.00	$40.60
	12/01/2016	$20.50	$7.45	$12.65	$0.00	$40.60
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	09/01/2015	$41.59	$9.80	$17.53	$0.00	$68.92

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.80	$9.80	$1.79	$0.00	$32.39
2	55	$22.87	$9.80	$1.79	$0.00	$34.46
3	60	$24.95	$9.80	$12.16	$0.00	$46.91
4	65	$27.03	$9.80	$12.16	$0.00	$48.99
5	70	$29.11	$9.80	$13.95	$0.00	$52.86
6	75	$31.19	$9.80	$13.95	$0.00	$54.94
7	80	$33.27	$9.80	$15.74	$0.00	$58.81
8	85	$35.35	$9.80	$15.74	$0.00	$60.89

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$30.13	$10.00	$14.90	$0.00	$55.03
	06/01/2016	$30.65	$10.00	$14.90	$0.00	$55.55
	12/01/2016	$31.52	$10.00	$14.90	$0.00	$56.42
	06/01/2017	$32.21	$10.00	$14.90	$0.00	$57.11
	12/01/2017	$32.90	$10.00	$14.90	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 1333*	06/01/2015	$35.08	$10.25	$8.00	$0.00	$53.33
	06/01/2016	$35.58	$10.70	$8.25	$0.00	$54.53

Apprentice - *GLAZIER - Local 1333*

Effective Date - 06/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.54	$10.25	$1.00	$0.00	$28.79
2	56	$19.73	$10.25	$1.00	$0.00	$30.98
3	63	$21.93	$10.25	$1.50	$0.00	$33.68
4	69	$24.12	$10.25	$1.50	$0.00	$35.87
5	75	$26.31	$10.25	$2.00	$0.00	$38.56
6	81	$28.50	$10.25	$2.00	$0.00	$40.75
7	88	$30.70	$10.25	$8.00	$0.00	$48.95
8	94	$32.89	$10.25	$8.00	$0.00	$51.14

Effective Date - 06/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.79	$10.70	$1.00	$0.00	$29.49
2	56	$20.01	$10.70	$1.00	$0.00	$31.71
3	63	$22.24	$10.70	$1.50	$0.00	$34.44
4	69	$24.46	$10.70	$1.50	$0.00	$36.66
5	75	$26.69	$10.70	$2.00	$0.00	$39.39
6	81	$28.91	$10.70	$2.00	$0.00	$41.61
7	88	$31.13	$10.70	$8.00	$0.00	$49.83
8	94	$33.36	$10.70	$8.00	$0.00	$52.06

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HOISTING ENGINEER/CRANES/GRADALLS	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
OPERATING ENGINEERS LOCAL 4	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 12/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$24.05	$10.00	$0.00	$0.00	$34.05
2	60	$26.24	$10.00	$14.90	$0.00	$51.14
3	65	$28.42	$10.00	$14.90	$0.00	$53.32
4	70	$30.61	$10.00	$14.90	$0.00	$55.51
5	75	$32.80	$10.00	$14.90	$0.00	$57.70
6	80	$34.98	$10.00	$14.90	$0.00	$59.88
7	85	$37.17	$10.00	$14.90	$0.00	$62.07
8	90	$39.36	$10.00	$14.90	$0.00	$64.26

Effective Date - 06/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$24.46	$10.00	$0.00	$0.00	$34.46
2	60	$26.69	$10.00	$14.90	$0.00	$51.59
3	65	$28.91	$10.00	$14.90	$0.00	$53.81
4	70	$31.14	$10.00	$14.90	$0.00	$56.04
5	75	$33.36	$10.00	$14.90	$0.00	$58.26
6	80	$35.58	$10.00	$14.90	$0.00	$60.48
7	85	$37.81	$10.00	$14.90	$0.00	$62.71
8	90	$40.03	$10.00	$14.90	$0.00	$64.93

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK)	10/01/2015	$36.10	$10.20	$13.72	$1.79	$61.81
SHEETMETAL WORKERS LOCAL 17 - B	04/01/2016	$36.60	$10.20	$13.72	$1.79	$62.31
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS)	09/01/2015	$38.31	$8.40	$11.28	$0.00	$57.99
ELECTRICIANS LOCAL 223	09/01/2016	$39.21	$8.90	$11.51	$0.00	$59.62
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR)	10/01/2015	$36.10	$10.20	$13.72	$1.79	$61.81
SHEETMETAL WORKERS LOCAL 17 - B	04/01/2016	$36.60	$10.20	$13.72	$1.79	$62.31
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER)	09/01/2015	$36.88	$11.00	$15.85	$0.00	$63.73
PLUMBERS & PIPEFITTERS LOCAL 51	03/01/2016	$37.63	$11.00	$15.85	$0.00	$64.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC MECHANIC *PLUMBERS & PIPEFITTERS LOCAL 51*	09/01/2015	$36.88	$11.00	$15.85	$0.00	$63.73
	03/01/2016	$37.63	$11.00	$15.85	$0.00	$64.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 2*	12/01/2015	$31.90	$7.45	$12.65	$0.00	$52.00
	06/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
	12/01/2016	$33.15	$7.45	$12.65	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)*	09/01/2015	$39.43	$11.50	$13.80	$0.00	$64.73
	09/01/2016	$41.23	$11.50	$13.80	$0.00	$66.53
	09/01/2017	$43.03	$11.50	$13.80	$0.00	$68.33
	09/01/2018	$45.05	$11.50	$13.80	$0.00	$70.35
	09/01/2019	$47.30	$11.50	$13.80	$0.00	$72.60

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Southern MA*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.72	$11.50	$10.70	$0.00	$41.92
2	60	$23.66	$11.50	$11.32	$0.00	$46.48
3	70	$27.60	$11.50	$11.94	$0.00	$51.04
4	80	$31.54	$11.50	$12.56	$0.00	$55.60

Effective Date - 09/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.62	$11.50	$10.70	$0.00	$42.82
2	60	$24.74	$11.50	$11.32	$0.00	$47.56
3	70	$28.86	$11.50	$11.94	$0.00	$52.30
4	80	$32.98	$11.50	$12.56	$0.00	$57.04

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 37*	09/16/2015	$34.01	$7.70	$16.00	$0.00	$57.71
	03/16/2016	$34.71	$7.70	$16.00	$0.00	$58.41

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 37*

Effective Date - 09/16/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	70	$23.81	$7.70	$16.00	$0.00	$47.51
2	75	$25.51	$7.70	$16.00	$0.00	$49.21
3	80	$27.21	$7.70	$16.00	$0.00	$50.91
4	85	$28.91	$7.70	$16.00	$0.00	$52.61
5	90	$30.61	$7.70	$16.00	$0.00	$54.31
6	95	$32.31	$7.70	$16.00	$0.00	$56.01

Effective Date - 03/16/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	70	$24.30	$7.70	$16.00	$0.00	$48.00
2	75	$26.03	$7.70	$16.00	$0.00	$49.73
3	80	$27.77	$7.70	$16.00	$0.00	$51.47
4	85	$29.50	$7.70	$16.00	$0.00	$53.20
5	90	$31.24	$7.70	$16.00	$0.00	$54.94
6	95	$32.97	$7.70	$16.00	$0.00	$56.67

Notes:

Apprentice to Journeyworker Ratio:1:4

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 2*

Effective Date - 12/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.69	$7.45	$12.65	$0.00	$38.79
2	70	$21.81	$7.45	$12.65	$0.00	$41.91
3	80	$24.92	$7.45	$12.65	$0.00	$45.02
4	90	$28.04	$7.45	$12.65	$0.00	$48.14

Effective Date - 06/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.99	$7.45	$12.65	$0.00	$39.09
2	70	$22.16	$7.45	$12.65	$0.00	$42.26
3	80	$25.32	$7.45	$12.65	$0.00	$45.42
4	90	$28.49	$7.45	$12.65	$0.00	$48.59

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 2*	12/01/2015	$31.35	$7.45	$12.60	$0.00	$51.40
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2015	$38.08	$10.18	$17.25	$0.00	$65.51
	02/01/2016	$38.08	$10.18	$17.70	$0.00	$65.96
	08/01/2016	$38.78	$10.18	$17.78	$0.00	$66.74
	02/01/2017	$39.24	$10.18	$17.78	$0.00	$67.20

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.04	$10.18	$17.25	$0.00	$46.47
2	60	$22.85	$10.18	$17.25	$0.00	$50.28
3	70	$26.66	$10.18	$17.25	$0.00	$54.09
4	80	$30.46	$10.18	$17.25	$0.00	$57.89
5	90	$34.27	$10.18	$17.25	$0.00	$61.70

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.04	$10.18	$17.70	$0.00	$46.92
2	60	$22.85	$10.18	$17.70	$0.00	$50.73
3	70	$26.66	$10.18	$17.70	$0.00	$54.54
4	80	$30.46	$10.18	$17.70	$0.00	$58.34
5	90	$34.27	$10.18	$17.70	$0.00	$62.15

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2015	$49.90	$10.18	$18.57	$0.00	$78.65
	02/01/2016	$49.90	$10.18	$19.14	$0.00	$79.22
	08/01/2016	$50.80	$10.18	$19.22	$0.00	$80.20
	02/01/2017	$51.37	$10.18	$19.22	$0.00	$80.77

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.95	$10.18	$18.57	$0.00	$53.70
2	60	$29.94	$10.18	$18.57	$0.00	$58.69
3	70	$34.93	$10.18	$18.57	$0.00	$63.68
4	80	$39.92	$10.18	$18.57	$0.00	$68.67
5	90	$44.91	$10.18	$18.57	$0.00	$73.66

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.95	$10.18	$19.14	$0.00	$54.27
2	60	$29.94	$10.18	$19.14	$0.00	$59.26
3	70	$34.93	$10.18	$19.14	$0.00	$64.25
4	80	$39.92	$10.18	$19.14	$0.00	$69.24
5	90	$44.91	$10.18	$19.14	$0.00	$74.23

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2) *MILLWRIGHTS LOCAL 1121 - Zone 2*	04/01/2015	$34.69	$9.80	$16.21	$0.00	$60.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 2*

Effective Date - 04/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.08	$9.80	$4.48	$0.00	$33.36
2	65	$22.55	$9.80	$13.36	$0.00	$45.71
3	75	$26.02	$9.80	$14.18	$0.00	$50.00
4	85	$29.49	$9.80	$14.99	$0.00	$54.28

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$22.27	$10.00	$14.90	$0.00	$47.17
	06/01/2016	$22.66	$10.00	$14.90	$0.00	$47.56
	12/01/2016	$23.31	$10.00	$14.90	$0.00	$48.21
	06/01/2017	$23.82	$10.00	$14.90	$0.00	$48.72
	12/01/2017	$24.34	$10.00	$14.90	$0.00	$49.24
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$26.08	$10.00	$14.90	$0.00	$50.98
	06/01/2016	$26.54	$10.00	$14.90	$0.00	$51.44
	12/01/2016	$27.29	$10.00	$14.90	$0.00	$52.19
	06/01/2017	$27.89	$10.00	$14.90	$0.00	$52.79
	12/01/2017	$28.50	$10.00	$14.90	$0.00	$53.40
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.76	$7.85	$0.00	$0.00	$32.61
2	55	$27.23	$7.85	$3.66	$0.00	$38.74
3	60	$29.71	$7.85	$3.99	$0.00	$41.55
4	65	$32.18	$7.85	$4.32	$0.00	$44.35
5	70	$34.66	$7.85	$14.11	$0.00	$56.62
6	75	$37.13	$7.85	$14.44	$0.00	$59.42
7	80	$39.61	$7.85	$14.77	$0.00	$62.23
8	90	$44.56	$7.85	$15.44	$0.00	$67.85

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.23	$7.85	$0.00	$0.00	$33.08
2	55	$27.75	$7.85	$3.66	$0.00	$39.26
3	60	$30.28	$7.85	$3.99	$0.00	$42.12
4	65	$32.80	$7.85	$4.32	$0.00	$44.97
5	70	$35.32	$7.85	$14.11	$0.00	$57.28
6	75	$37.85	$7.85	$14.44	$0.00	$60.14
7	80	$40.37	$7.85	$14.77	$0.00	$62.99
8	90	$45.41	$7.85	$15.44	$0.00	$68.70

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2016	$40.41	$7.85	$16.10	$0.00	$64.36
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2016	$41.36	$7.85	$16.10	$0.00	$65.31
	01/01/2017	$42.31	$7.85	$16.10	$0.00	$66.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.21	$7.85	$0.00	$0.00	$28.06
2	55	$22.23	$7.85	$3.66	$0.00	$33.74
3	60	$24.25	$7.85	$3.99	$0.00	$36.09
4	65	$26.27	$7.85	$4.32	$0.00	$38.44
5	70	$28.29	$7.85	$14.11	$0.00	$50.25
6	75	$30.31	$7.85	$14.44	$0.00	$52.60
7	80	$32.33	$7.85	$14.77	$0.00	$54.95
8	90	$36.37	$7.85	$15.44	$0.00	$59.66

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.68	$7.85	$0.00	$0.00	$28.53
2	55	$22.75	$7.85	$3.66	$0.00	$34.26
3	60	$24.82	$7.85	$3.99	$0.00	$36.66
4	65	$26.88	$7.85	$4.32	$0.00	$39.05
5	70	$28.95	$7.85	$14.11	$0.00	$50.91
6	75	$31.02	$7.85	$14.44	$0.00	$53.31
7	80	$33.09	$7.85	$14.77	$0.00	$55.71
8	90	$37.22	$7.85	$15.44	$0.00	$60.51

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2016	$38.47	$7.85	$16.10	$0.00	$62.42
	07/01/2016	$39.42	$7.85	$16.10	$0.00	$63.37
	01/01/2017	$40.37	$7.85	$16.10	$0.00	$64.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.24	$7.85	$0.00	$0.00	$27.09
2	55	$21.16	$7.85	$3.66	$0.00	$32.67
3	60	$23.08	$7.85	$3.99	$0.00	$34.92
4	65	$25.01	$7.85	$4.32	$0.00	$37.18
5	70	$26.93	$7.85	$14.11	$0.00	$48.89
6	75	$28.85	$7.85	$14.44	$0.00	$51.14
7	80	$30.78	$7.85	$14.77	$0.00	$53.40
8	90	$34.62	$7.85	$15.44	$0.00	$57.91

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.71	$7.85	$0.00	$0.00	$27.56
2	55	$21.68	$7.85	$3.66	$0.00	$33.19
3	60	$23.65	$7.85	$3.99	$0.00	$35.49
4	65	$25.62	$7.85	$4.32	$0.00	$37.79
5	70	$27.59	$7.85	$14.11	$0.00	$49.55
6	75	$29.57	$7.85	$14.44	$0.00	$51.86
7	80	$31.54	$7.85	$14.77	$0.00	$54.16
8	90	$35.48	$7.85	$15.44	$0.00	$58.77

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 2*	12/01/2015	$31.15	$7.45	$12.65	$0.00	$51.25
	06/01/2016	$31.65	$7.45	$12.65	$0.00	$51.75
	12/01/2016	$32.40	$7.45	$12.65	$0.00	$52.50
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2016	$39.01	$7.85	$16.10	$0.00	$62.96
	07/01/2016	$39.96	$7.85	$16.10	$0.00	$63.91
	01/01/2017	$40.91	$7.85	$16.10	$0.00	$64.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.51	$7.85	$0.00	$0.00	$27.36
2	55	$21.46	$7.85	$3.66	$0.00	$32.97
3	60	$23.41	$7.85	$3.99	$0.00	$35.25
4	65	$25.36	$7.85	$4.32	$0.00	$37.53
5	70	$27.31	$7.85	$14.11	$0.00	$49.27
6	75	$29.26	$7.85	$14.44	$0.00	$51.55
7	80	$31.21	$7.85	$14.77	$0.00	$53.83
8	90	$35.11	$7.85	$15.44	$0.00	$58.40

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.98	$7.85	$0.00	$0.00	$27.83
2	55	$21.98	$7.85	$3.66	$0.00	$33.49
3	60	$23.98	$7.85	$3.99	$0.00	$35.82
4	65	$25.97	$7.85	$4.32	$0.00	$38.14
5	70	$27.97	$7.85	$14.11	$0.00	$49.93
6	75	$29.97	$7.85	$14.44	$0.00	$52.26
7	80	$31.97	$7.85	$14.77	$0.00	$54.59
8	90	$35.96	$7.85	$15.44	$0.00	$59.25

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2016	$37.07	$7.85	$16.10	$0.00	$61.02
	07/01/2016	$38.02	$7.85	$16.10	$0.00	$61.97
	01/01/2017	$38.97	$7.85	$16.10	$0.00	$62.92

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.54	$7.85	$0.00	$0.00	$26.39
2	55	$20.39	$7.85	$3.66	$0.00	$31.90
3	60	$22.24	$7.85	$3.99	$0.00	$34.08
4	65	$24.10	$7.85	$4.32	$0.00	$36.27
5	70	$25.95	$7.85	$14.11	$0.00	$47.91
6	75	$27.80	$7.85	$14.44	$0.00	$50.09
7	80	$29.66	$7.85	$14.77	$0.00	$52.28
8	90	$33.36	$7.85	$15.44	$0.00	$56.65

Effective Date - 07/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.01	$7.85	$0.00	$0.00	$26.86
2	55	$20.91	$7.85	$3.66	$0.00	$32.42
3	60	$22.81	$7.85	$3.99	$0.00	$34.65
4	65	$24.71	$7.85	$4.32	$0.00	$36.88
5	70	$26.61	$7.85	$14.11	$0.00	$48.57
6	75	$28.52	$7.85	$14.44	$0.00	$50.81
7	80	$30.42	$7.85	$14.77	$0.00	$53.04
8	90	$34.22	$7.85	$15.44	$0.00	$57.51

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2012	$30.28	$9.07	$8.00	$0.00	$47.35
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.02	$9.80	$19.23	$0.00	$50.05
2	60	$25.22	$9.80	$19.23	$0.00	$54.25
3	70	$29.43	$9.80	$19.23	$0.00	$58.46
4	75	$31.53	$9.80	$19.23	$0.00	$60.56
5	80	$33.63	$9.80	$19.23	$0.00	$62.66
6	80	$33.63	$9.80	$19.23	$0.00	$62.66
7	90	$37.84	$9.80	$19.23	$0.00	$66.87
8	90	$37.84	$9.80	$19.23	$0.00	$66.87

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPELAYER *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
PLUMBER & PIPEFITTER *PLUMBERS & PIPEFITTERS LOCAL 51*	09/01/2015	$36.88	$11.00	$15.85	$0.00	$63.73
	03/01/2016	$37.63	$11.00	$15.85	$0.00	$64.48

Apprentice - *PLUMBER/PIPEFITTER - Local 51*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$14.75	$11.00	$1.50	$0.00	$27.25
2	50	$18.44	$11.00	$1.50	$0.00	$30.94
3	60	$22.13	$11.00	$7.85	$0.00	$40.98
4	70	$25.82	$11.00	$11.66	$0.00	$48.48
5	80	$29.50	$11.00	$14.20	$0.00	$54.70

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$15.05	$11.00	$1.50	$0.00	$27.55
2	50	$18.82	$11.00	$1.50	$0.00	$31.32
3	60	$22.58	$11.00	$7.85	$0.00	$41.43
4	70	$26.34	$11.00	$11.66	$0.00	$49.00
5	80	$30.10	$11.00	$14.20	$0.00	$55.30

Notes:

Steps 2000hrs. Prior 9/1/05; 40/40/45/50/55/60/65/75/80/85

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC CONTROLS (TEMP.) *PLUMBERS & PIPEFITTERS LOCAL 51*	09/01/2015	$36.88	$11.00	$15.85	$0.00	$63.73
	03/01/2016	$37.63	$11.00	$15.85	$0.00	$64.48
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 2*	12/01/2015	$32.15	$7.45	$12.65	$0.00	$52.25
	06/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
	12/01/2016	$33.40	$7.45	$12.65	$0.00	$53.50
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$30.13	$10.00	$14.90	$0.00	$55.03
	06/01/2016	$30.65	$10.00	$14.90	$0.00	$55.55
	12/01/2016	$31.52	$10.00	$14.90	$0.00	$56.42
	06/01/2017	$32.21	$10.00	$14.90	$0.00	$57.11
	12/01/2017	$32.90	$10.00	$14.90	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS LOCAL 59*	06/01/2008	$19.00	$5.10	$4.21	$0.00	$28.31
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) *CARPENTERS -ZONE 1 (Residential Wood)*	04/01/2011	$37.25	$8.67	$15.51	$0.00	$61.43
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement.*CARPENTERS -ZONE 1 (Residential Wood)*	05/01/2011	$27.49	$6.34	$6.23	$0.00	$40.06
As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Residential Wood Frame) - Zone 1*

Effective Date - 05/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$16.49	$6.34	$0.00	$0.00	$22.83
2	60	$16.49	$6.34	$6.23	$0.00	$29.06
3	65	$17.87	$6.34	$6.23	$0.00	$30.44
4	70	$19.24	$6.34	$6.23	$0.00	$31.81
5	75	$20.62	$6.34	$6.23	$0.00	$33.19
6	80	$21.99	$6.34	$6.23	$0.00	$34.56
7	85	$23.37	$6.34	$6.23	$0.00	$35.94
8	90	$24.74	$6.34	$6.23	$0.00	$37.31

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	08/01/2015	$40.11	$11.00	$12.00	$0.00	$63.11
	02/01/2016	$41.01	$11.00	$12.00	$0.00	$64.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.06	$11.00	$3.38	$0.00	$34.44
2	60	$24.07	$11.00	$12.00	$0.00	$47.07
3	65	$26.07	$11.00	$12.00	$0.00	$49.07
4	75	$30.08	$11.00	$12.00	$0.00	$53.08
5	85	$34.09	$11.00	$12.00	$0.00	$57.09

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.51	$11.00	$3.38	$0.00	$34.89
2	60	$24.61	$11.00	$12.00	$0.00	$47.61
3	65	$26.66	$11.00	$12.00	$0.00	$49.66
4	75	$30.76	$11.00	$12.00	$0.00	$53.76
5	85	$34.86	$11.00	$12.00	$0.00	$57.86

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	08/01/2015	$40.36	$11.00	$12.00	$0.00	$63.36
	02/01/2016	$41.26	$11.00	$12.00	$0.00	$64.26
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - B*	10/01/2015	$36.10	$10.20	$13.72	$1.79	$61.81
	04/01/2016	$36.60	$10.20	$13.72	$1.79	$62.31

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-B*

Effective Date - 10/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$14.44	$10.20	$3.28	$0.84	$28.76
2	45	$16.25	$10.20	$3.69	$0.91	$31.05
3	50	$18.05	$10.20	$8.57	$1.11	$37.93
4	55	$19.86	$10.20	$8.57	$1.17	$39.80
5	60	$21.66	$10.20	$11.17	$1.29	$44.32
6	65	$23.47	$10.20	$11.38	$1.35	$46.40
7	70	$25.27	$10.20	$11.60	$1.41	$48.48
8	75	$27.08	$10.20	$11.82	$1.47	$50.57
9	80	$28.88	$10.20	$12.03	$1.53	$52.64
10	85	$30.69	$10.20	$12.25	$1.59	$54.73

Effective Date - 04/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$14.64	$10.20	$3.28	$0.84	$28.96
2	45	$16.47	$10.20	$3.69	$0.91	$31.27
3	50	$18.30	$10.20	$8.57	$1.11	$38.18
4	55	$20.13	$10.20	$8.57	$1.17	$40.07
5	60	$21.96	$10.20	$11.17	$1.30	$44.63
6	65	$23.79	$10.20	$11.38	$1.36	$46.73
7	70	$25.62	$10.20	$11.60	$1.42	$48.84
8	75	$27.45	$10.20	$11.82	$1.48	$50.95
9	80	$29.28	$10.20	$12.03	$1.55	$53.06
10	85	$31.11	$10.20	$12.25	$1.61	$55.17

Notes:

Apprentice to Journeyworker Ratio:1:3

SIGN ERECTOR *PAINTERS LOCAL 35 - ZONE 2*	06/01/2013	$25.81	$7.07	$7.05	$0.00	$39.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SIGN ERECTOR - Local 35 Zone 2*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$12.91	$7.07	$0.00	$0.00	$19.98
2	55	$14.20	$7.07	$2.45	$0.00	$23.72
3	60	$15.49	$7.07	$2.45	$0.00	$25.01
4	65	$16.78	$7.07	$2.45	$0.00	$26.30
5	70	$18.07	$7.07	$7.05	$0.00	$32.19
6	75	$19.36	$7.07	$7.05	$0.00	$33.48
7	80	$20.65	$7.07	$7.05	$0.00	$34.77
8	85	$21.94	$7.07	$7.05	$0.00	$36.06
9	90	$23.23	$7.07	$7.05	$0.00	$37.35

Notes:
Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2015	$31.94	$10.41	$10.08	$0.00	$52.43
	06/01/2016	$32.44	$10.41	$10.08	$0.00	$52.93
	08/01/2016	$32.44	$10.91	$10.08	$0.00	$53.43
	12/01/2016	$32.44	$10.91	$10.89	$0.00	$54.24
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2015	$32.23	$10.41	$10.08	$0.00	$52.72
	06/01/2016	$32.73	$10.41	$10.08	$0.00	$53.22
	08/01/2016	$32.73	$10.91	$10.08	$0.00	$53.72
	12/01/2016	$32.73	$10.91	$10.89	$0.00	$54.53
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2*	01/01/2016	$48.99	$8.67	$15.80	$0.00	$73.46
	03/01/2016	$49.89	$8.67	$15.80	$0.00	$74.36
	10/01/2016	$50.93	$8.67	$15.80	$0.00	$75.40
	03/01/2017	$51.83	$8.67	$15.80	$0.00	$76.30

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SPRINKLER FITTER - Local 550 (Section B) Zone 2*

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.15	$8.67	$8.55	$0.00	$34.37
2	40	$19.60	$8.67	$8.55	$0.00	$36.82
3	45	$22.05	$8.67	$8.55	$0.00	$39.27
4	50	$24.50	$8.67	$8.55	$0.00	$41.72
5	55	$26.94	$8.67	$8.55	$0.00	$44.16
6	60	$29.39	$8.67	$8.55	$0.00	$46.61
7	65	$31.84	$8.67	$8.55	$0.00	$49.06
8	70	$34.29	$8.67	$8.55	$0.00	$51.51
9	75	$36.74	$8.67	$8.55	$0.00	$53.96
10	80	$39.19	$8.67	$8.55	$0.00	$56.41

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.46	$8.67	$8.55	$0.00	$34.68
2	40	$19.96	$8.67	$8.55	$0.00	$37.18
3	45	$22.45	$8.67	$8.55	$0.00	$39.67
4	50	$24.95	$8.67	$8.55	$0.00	$42.17
5	55	$27.44	$8.67	$8.55	$0.00	$44.66
6	60	$29.93	$8.67	$8.55	$0.00	$47.15
7	65	$32.43	$8.67	$8.55	$0.00	$49.65
8	70	$34.92	$8.67	$8.55	$0.00	$52.14
9	75	$37.42	$8.67	$8.55	$0.00	$54.64
10	80	$39.91	$8.67	$8.55	$0.00	$57.13

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 223*	09/01/2015	$32.56	$8.40	$9.59	$0.00	$50.55
	09/01/2016	$33.33	$8.90	$9.78	$0.00	$52.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 223*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	$0.00	$0.00	$0.00	$0.00	$0.00

Notes: See Electrician Apprentice Wages
Steps are 750hrs
Telecom Apprentice Wages shall be the same as the Electrician Apprentice Wages

Apprentice to Journeyworker Ratio:2:3

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2015	$48.80	$10.18	$18.57	$0.00	$77.55
	02/01/2016	$48.80	$10.18	$19.14	$0.00	$78.12
	08/01/2016	$49.70	$10.18	$19.22	$0.00	$79.10
	02/01/2017	$50.27	$10.18	$19.22	$0.00	$79.67

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.40	$10.18	$18.57	$0.00	$53.15
2	60	$29.28	$10.18	$18.57	$0.00	$58.03
3	70	$34.16	$10.18	$18.57	$0.00	$62.91
4	80	$39.04	$10.18	$18.57	$0.00	$67.79
5	90	$43.92	$10.18	$18.57	$0.00	$72.67

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.40	$10.18	$19.14	$0.00	$53.72
2	60	$29.28	$10.18	$19.14	$0.00	$58.60
3	70	$34.16	$10.18	$19.14	$0.00	$63.48
4	80	$39.04	$10.18	$19.14	$0.00	$68.36
5	90	$43.92	$10.18	$19.14	$0.00	$73.24

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$36.70	$7.45	$13.75	$0.00	$57.90
	06/01/2016	$37.45	$7.45	$13.75	$0.00	$58.65
	12/01/2016	$38.45	$7.45	$13.75	$0.00	$59.65
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$35.42	$7.45	$13.75	$0.00	$56.62
	06/01/2016	$36.17	$7.45	$13.75	$0.00	$57.37
	12/01/2016	$37.17	$7.45	$13.75	$0.00	$58.37
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2015	$35.30	$7.45	$13.75	$0.00	$56.50
	06/01/2016	$36.05	$7.45	$13.75	$0.00	$57.25
	12/01/2016	$37.05	$7.45	$13.75	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.31	$10.00	$14.90	$0.00	$68.21
	06/01/2016	$44.06	$10.00	$14.90	$0.00	$68.96
	12/01/2016	$45.29	$10.00	$14.90	$0.00	$70.19
	06/01/2017	$46.28	$10.00	$14.90	$0.00	$71.18
	12/01/2017	$47.27	$10.00	$14.90	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2015	$32.52	$10.41	$10.08	$0.00	$53.01
	06/01/2016	$33.02	$10.41	$10.08	$0.00	$53.51
	08/01/2016	$33.02	$10.91	$10.08	$0.00	$54.01
	12/01/2016	$33.02	$10.91	$10.89	$0.00	$54.82
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2015	$47.58	$7.45	$14.15	$0.00	$69.18
	06/01/2016	$48.33	$7.45	$14.15	$0.00	$69.93
	12/01/2016	$49.33	$7.45	$14.15	$0.00	$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2015	$49.58	$7.45	$14.15	$0.00	$71.18
	06/01/2016	$50.33	$7.45	$14.15	$0.00	$71.93
	12/01/2016	$51.33	$7.45	$14.15	$0.00	$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2015	$39.65	$7.45	$14.15	$0.00	$61.25
	06/01/2016	$40.40	$7.45	$14.15	$0.00	$62.00
	12/01/2016	$41.40	$7.45	$14.15	$0.00	$63.00
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2015	$41.65	$7.45	$14.15	$0.00	$63.25
	06/01/2016	$42.40	$7.45	$14.15	$0.00	$64.00
	12/01/2016	$43.40	$7.45	$14.15	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2015	$31.94	$10.41	$10.08	$0.00	$52.43
	06/01/2016	$32.44	$10.41	$10.08	$0.00	$52.93
	08/01/2016	$32.44	$10.91	$10.08	$0.00	$53.43
	12/01/2016	$32.44	$10.91	$10.89	$0.00	$54.24
WAGON DRILL OPERATOR *LABORERS - ZONE 2*	12/01/2015	$31.40	$7.45	$12.65	$0.00	$51.50
	06/01/2016	$31.90	$7.45	$12.65	$0.00	$52.00
	12/01/2016	$32.65	$7.45	$12.65	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2015	$43.73	$10.00	$14.90	$0.00	$68.63
	06/01/2016	$44.48	$10.00	$14.90	$0.00	$69.38
	12/01/2016	$45.73	$10.00	$14.90	$0.00	$70.63
	06/01/2017	$46.73	$10.00	$14.90	$0.00	$71.63
	12/01/2017	$47.73	$10.00	$14.90	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & PIPEFITTERS LOCAL 51*	09/01/2015	$36.88	$11.00	$15.85	$0.00	$63.73
	03/01/2016	$37.63	$11.00	$15.85	$0.00	$64.48
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2015	$26.11	$7.25	$1.78	$0.00	$35.14
	08/28/2016	$26.61	$7.50	$1.80	$0.00	$35.91
	09/03/2017	$27.14	$7.75	$1.81	$0.00	$36.70
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2015	$36.98	$7.25	$8.12	$0.00	$52.35
	08/28/2016	$37.70	$7.50	$8.87	$0.00	$54.07
	09/03/2017	$38.45	$7.75	$9.53	$0.00	$55.73
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2015	$30.46	$7.25	$8.34	$0.00	$46.05
	08/28/2016	$31.05	$7.50	$8.89	$0.00	$47.44
	09/03/2017	$31.66	$7.75	$9.44	$0.00	$48.85
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2015	$23.93	$7.25	$1.72	$0.00	$32.90
	08/28/2016	$24.39	$7.50	$1.73	$0.00	$33.62
	09/03/2017	$24.88	$7.75	$1.75	$0.00	$34.38
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2015	$36.98	$7.25	$12.29	$0.00	$56.52
	08/28/2016	$37.70	$7.50	$12.95	$0.00	$58.15
	09/03/2017	$38.45	$7.75	$13.61	$0.00	$59.81
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2015	$32.63	$7.25	$9.05	$0.00	$48.93
	08/28/2016	$33.26	$7.50	$9.63	$0.00	$50.39
	09/03/2017	$33.92	$7.75	$10.21	$0.00	$51.88
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2015	$23.93	$7.25	$1.72	$0.00	$32.90
	08/28/2016	$24.39	$7.50	$1.73	$0.00	$33.62
	09/03/2017	$24.88	$7.75	$1.75	$0.00	$34.38
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2015	$19.58	$7.25	$1.59	$0.00	$28.42
	08/28/2016	$19.96	$7.50	$1.60	$0.00	$29.06
	09/03/2017	$20.35	$7.75	$1.61	$0.00	$29.71
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2015	$43.51	$7.25	$15.06	$0.00	$65.82
	08/28/2016	$44.35	$7.50	$15.83	$0.00	$67.68
	09/03/2017	$45.23	$7.75	$16.61	$0.00	$69.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 08/30/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$26.11	$7.25	$3.28	$0.00	$36.64
2	65	$28.28	$7.25	$3.35	$0.00	$38.88
3	70	$30.46	$7.25	$3.41	$0.00	$41.12
4	75	$32.63	$7.25	$4.98	$0.00	$44.86
5	80	$34.81	$7.25	$5.04	$0.00	$47.10
6	85	$36.98	$7.25	$5.11	$0.00	$49.34
7	90	$39.16	$7.25	$7.17	$0.00	$53.58

Effective Date - 08/28/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$26.61	$7.50	$3.30	$0.00	$37.41
2	65	$28.83	$7.50	$3.36	$0.00	$39.69
3	70	$31.05	$7.50	$3.43	$0.00	$41.98
4	75	$33.26	$7.50	$5.00	$0.00	$45.76
5	80	$35.48	$7.50	$5.06	$0.00	$48.04
6	85	$37.70	$7.50	$5.13	$0.00	$50.33
7	90	$39.92	$7.50	$7.20	$0.00	$54.62

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/01/2016	$28.98	$4.25	$3.12	$0.00	$36.35
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/01/2016	$27.31	$4.25	$3.07	$0.00	$34.63
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/01/2016	$27.31	$4.25	$3.07	$0.00	$34.63
TREE TRIMMER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/01/2015	$18.05	$3.55	$0.00	$0.00	$21.60
	01/31/2016	$18.51	$3.55	$0.00	$0.00	$22.06

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground. This classification does not apply to wholesale tree removal.

TREE TRIMMER GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/01/2015	$15.92	$3.55	$0.00	$0.00	$19.47
	01/31/2016	$16.32	$3.55	$0.00	$0.00	$19.87

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.